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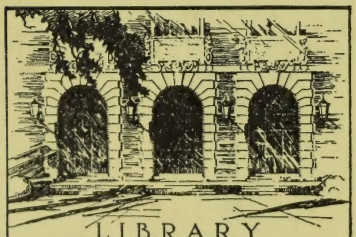

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CONTENTS.

PAGE.

DR. JAMES JAMIESON : Drainage of Adelaide and its Influence on the Death-Rate - - - - - - - - - 1

DR. H. WHITTELL : Effect of Deep Drainage on the Rate of Mortality in Adelaide and Suburbs - - - - - - - 9

PROF. E. H. RENNIE : On Some So-called South Australian Rubies - 17

THOMAS PARKER : An Automatic River Guage - - - - 19

DR. E. C. STIRLING : Preliminary Notes on a New Australian Mammal 21

J. G. O. TEPPER : Surface Features and Rocks of Nuriootpa - - 25

JOHN DENNANT : On the Muddy Creek Beds (plate i.) - - - 30

PROF. R. TATE : New Species of Marine Mollusca from South Australia and Victoria (plate xi.) - - - - - - - 60

PROF. R. TATE : Supplementary List of the Lamellibranch and Palliobranch Mollusca of South Anstralia - - - - - 67

PROF. R. TATE : A Census of the Molluscan Fauna of Australia- - 70

PROF. R. TATE : Additions to the Flora of the Port Lincoln District, with Description of two New Species - - - - - 82

PROF. R. TATE : Plants of the Lake Eyre Basin - - - 85

W. M. MASKELL : New South Australian Coccidæ (plates xii. to xiv.) - 101

D. B. ADAMSON : On Measuring the Power of Telescopic Eypieces - 112

PROF. R. TATE : The Gastropods of the Older Tertiary of Australia Part II. (plates ii. to x.) - - - - - - - 116

REV. T. BLACKBURN : Descriptions of New Species of Australian Coleoptera - - - - - - - - - 175

WALTER HOWCHIN : On the Occurence of Coal Detritus in the Valley of the Murray - - - - - - - - - 215

DR. M. C. COOKE : List of Fungi collected near Lake Bonney - - 217

PAGE.

Abstract of Proceedings - - - - - - - 218

Annual Report - - - - - - - - 222

President's Address - - - - - - - 225

Balance-Sheet - - - - - - - - 235

Donations to the Library - - - - - - 236

List of Fellows and Members - - - - - 243

Report of the Field Naturalists' Section - - - - 246

Report of the Microscopical Section - - - - 249

The Drainage of Adelaide and its Influence on the Death-Rate.

By James Jamieson, M.D., Health Officer, City of Melbourne.

[Read November 1st, 1887.]

In the course of a recent visit to Adelaide I was greatly impressed by the evidence of cleanliness everywhere and the freedom from smells. The system of drainage adopted appeared to be excellent in its workings, and I was anxious to discover what had been the effect on the public health resulting from its introduction. Accordingly I obtained, by the courtesy of Dr. Whittell, the Registrar-General, a set of the annual reports on the vital statistics of South Australia for the years 1882 to 1886, embracing the period just before and that just following the completion of the deep drainage system.

At the first glance it appears as if the result, in reduction of the death-rate, had been very marked. According to the reports the death-rate for Adelaide and suburbs, which had averaged 21·38 per 1,000 in the ten years 1875-84, and had never been less than 19·71 (in 1877), fell suddenly in 1885 to 14·34, and in 1886 to 14·31. Such an extraordinary reduction in the rate of mortality, suddenly produced, is probably unprecedented in the sanitary history of any city or town of similar population, and is calculated to excite suspicion that some fallacy has been allowed to creep in. The possibility of error is, of course, admitted by the Registrar-General, who says (Report for 1886): "The peculiar circumstances of the colony during the last two or three years have caused fluctuations in different districts and towns, which may lead to some error in the estimates, which cannot be adjusted till a new census has been taken."

The probability of error, suggested by the very fact of the death-rate having fallen to such an extent, is confirmed by the circumstance that in the same years (1885 and 1886) there was likewise an almost equal lowering in the birth-rate. Now, to whatever cause this may have been due, it cannot be supposed to have resulted from the sanitary improvements, to which a reduction in the death-rate might be ascribed. As regards the lowered birth-rate there can hardly be doubt that its cause is to be found in the commercial depression which has for some time existed in South Australia, and which has probably affected chiefly and most severely the capital.

It may be assumed as certain that there has been some drifting of population from Adelaide and its suburbs. But as the Registrar-General had no data enabling him to determine how great had been the loss of population so produced, he was compelled to follow the usual course in framing his estimates year by year. The population of the city and suburbs is thus represented as having increased from 103,864 in 1881, the census year, to 128,377 in 1886. It is more than probable that there has been no such increase, and I venture to suggest a means of calculating, with an approximation to accuracy, what the actual population numbered in 1885 and 1886. The calculation is based on the assumption that the birth rate is nearly a fixed quantity from year to year, and, as a matter of fact, the fluctuation between 1881 and 1884 was only from 42·17 to 42·89 per 1,000 of the population. The sudden fall to 33·61 per 1,000 in 1885, and to 28·24 in 1886 can hardly, therefore, be taken as correctly representing the true condition. It is true that hard times may lead to a lowering of the birth rate, in part directly, though chiefly by lessening the number of marriages; but such an effect is not likely to be so rapid or so marked in Australia as in countries less favourably situated. Without claiming absolute accuracy for the calculations here presented, I venture nevertheless to insist that they offer a nearer approach to the true numbers than official estimates. Taking the population and the number of births in 1881 as showing the true proportion, and assuming that there was a similar proportion existing in 1885 and 1886, a simple rule of three calculation gives the following results. The births in 1881, to the number of 4,424, corresponded to a population of 103,864, and therefore 4,270 births in 1885, and 3,626 births in 1886 may be taken as representing a population of 100,248 in 1885, and 85,129 in 1886. And having obtained an approximately correct population basis we are in a position to calculate, with a similar approximation to accuracy, the true death rate in the same years, viz., 18·17 per 1,000 in 1885, and 21·59 per 1,000 in 1886. If the two years are taken together, to eliminate accidental variations, the rate is found to have averaged 19·74, or rather less than the average of the three previous years, 1882-84, which was 21·11, and almost the same as the most favourable of the ten previous years, viz., 1877, with a rate of 19·71.

While it seems probable, therefore, that there has been some reduction in the death-rate in 1885 and in 1886, it must also be regarded as certain that the reduction has not been nearly so great as is shown in the official estimates.

But the influence of sanitary improvements on the health of the population may be shown in a different way. There are cer-

tain diseases whose prevalence and fatality are generally taken as safe tests of the sanitary condition of a town or district, and in particular of the purity of the water supply and the completeness and perfection of the drainage system. They may be dependent, in greater or less degree, on other conditions; but the mortality caused by them may be expected to vary with those just mentioned. The diseases which may be regarded as dependent for the degree of their prevalence, more than almost any others, on the sanitary condition of a district are typhoid fever and the group known as the diarrhœal diseases. Bad drainage, filthy surroundings, and saturation of the soil with foul water are generally regarded as favouring their occurrence, while the opposite conditions, in similar degree, tend to limit their prevalence, other things being equal. Now, in Adelaide I do not understand that there has been any material change in the water supply of late years, and a marked diminution in the fatality from the diseases named may, if found, be fairly put to the credit of the improved drainage. I have endeavoured to make a comparison of the mortality returns of the last few years, with the view of discovering whether or not this has been actually the case. For that purpose, however, it has been necessary to adopt a different basis from that supplied by the total area described as *Adelaide and suburbs*, since, though the deaths are given according to the registration districts in which they occurred, it is not possible to make out what the districts are which go to make up that area. It has been necessary, therefore, to have recourse, for purposes of comparison, to the registration district of Adelaide, which seems to be wider in extent than the city of Adelaide, though smaller than the full metropolitan area described as Adelaide and suburbs. This arrangement is, I venture to suggest, a little confusing to those who consult the annual reports without possessing the advantage of local knowledge. Still, it is possible to make a comparison of the mortality for a series of years in the same district and that corresponding closely with the area which has been efficiently provided with sewers. The following table shows the total mortality in the Adelaide registration district for each of the years 1882-86, with the deaths in the same years from typhoid and from diarrhœa, dysentery, and cholera :—

	Total deaths.	Deaths from Typhoid.	Deaths from Diarrhœal Diseases.
1882.	1,752	82	174
1883.	1,604	62	176
1884.	1,710	68	179
1885.	1,332	46	124
1886.	1,380	40	76

It is unnecessary to discuss again whether the reduction in the

total number of deaths is in itself a proof that the mortality-rate has been lowered in the last two years ; I wish rather to point out the fact that there has been a marked reduction, both absolutely and relatively, in the mortality from the diseases selected for consideration. While in the three years 1882-84 the deaths from typhoid amounted to 4.18 per cent. of the whole, they formed only 3·17 per cent. of the total mortality in 1885-86. Again, in 1882-84 the diarrhœal diseases were responsible for 10·44 per cent. of the total mortality, while in 1885-86 that percentage was only 7·37.

These figures appear to show very satisfactory results, but it is necessary to admit that they may fairly be subjected to criticism before being accepted as proof of the benefits following sanitary improvements. It may be alleged with reference to the lowered death-rate from typhoid that it is simply due to the fluctuations observed to occur in the prevalence of this disease. And with reference to the diminution in the number of deaths from the diarrhœal class of diseases, it may be insisted that the reduction is the consequence of the lowered birth-rate, most of the deaths from these diseases occurring among infants.

These criticisms are fair, and must therefore be fairly met, and that which applies to the lowered mortality from typhoid can, I think, be fully met, though it must be admitted that the figures referring to the diarrhœal death-rate cannot be taken as very conclusive evidence. The general validity of the conclusions may be tested in the following way :—If the lessened mortality in 1885-86 was simply owing to accidental fluctuations, the result of seasonal or other influences not clearly ascertained, then there ought to have been a somewhat similar range of fluctuation in other districts. For the purpose of discovering whether or not this was the case, I have constructed the following table, the figures in which apply to the whole of South Australia, exclusive of the registration district of Adelaide.

	Total deaths.	Deaths from Typhoid.	Deaths from Diarrhœal Diseases.
1882	2,641	64	308
1883	2,831	73	305
1884	3,079	66	259
1885	2,655	86	210
1886	2,654	53	252

When rates are calculated, as before, it appears that, while typhoid caused 2·37, per cent. of the total mortality in 1882-84, the percentage was 2·52 in 1885-86. In the two periods the percentage of the general death rate from the diarrhœal diseases was 10·19 and 8·38 respectively.

The rates for each of the districts compared may be thrown into a table thus—

	Percentage of deaths from Typhoid.		Percentage of deaths from Diarrhœal Diseases.	
	1882-84	1885-86	1882-84	1885-86
Adelaide District ...	4·18	3·17	10·44	7·37
Rest of S. Australia ...	2·37	2·52	10·19	8·38

I am not inclined to lay stress on the reduction in the relative death rate from the diarrhœal diseases, since there was a reduction in both districts, and to an extent somewhat proportional to the lessened number of births. But the figures referring to typhoid cannot admit of any explanation applying to both. Though the mortality from typhoid is, on the average, greater in Adelaide than in other parts of the colony, there has been in the former a reduction of about one-fourth, while in the latter there has been a slight increase in the second period, 1885-86. If climatic, or any other general conditions, had been the cause of the lowered rate of mortality from typhoid in Adelaide, it is difficult to see why they should not have shown their effect, at least to some extent in a similar way, in other parts of the colony. The presumption rather is that the true cause of the lessened death rate in Adelaide has been the improvement in the drainage system.

If, therefore, there has been a distinct, if not very great reduction in the general rate of mortality, and a marked reduction in that resulting from typhoid—the disease above all others amenable to the influence of sanitary improvements—it is a fair inference that these improvements have had the effect which might reasonably have been anticipated. Further experience may be needed to make this conclusion incontrovertible, but the proof is sufficiently strong to encourage the authorities in other cities and towns to follow the example of Adelaide. My hope is that it may strengthen the hands of those who are endeavouring to obtain for Melbourne a similar boon, since I have long been persuaded, and often declared, that it is chiefly from the adoption of a proper system of drainage that we can expect to have a decided check given to the prevalence of typhoid, which has for many years been a constant scourge.

In conclusion, may I venture to suggest that it is the duty of the Government of South Australia to have such a census taken of the population of Adelaide as will allow of an accurate calculation of the death-rate, so that we may not be in uncertainty whether or not the system of drainage recently adopted has actually lowered the death-rate of the city to an extent at all approaching that brought out in the official reports. The expense need not be great, and the matter is one of no small importance, and should not be waited for till 1891, the regular census year.

Supplemental Remarks.

[Read December 6th, 1887.]

Many thanks for your [Dr. Whittell's] courtesy in sending me an analysis of the paper which you have prepared for the next meeting of the Royal Society. I do not know that it is possible for me to add much to what was said in my paper, though I am sufficiently well aware of its imperfections, and indeed confessed to a liability to error from want of local knowledge. I was not long in Adelaide, on the occasion of my recent visit, till I heard the claim made that it is not only the cleanest but the healthiest city in Australasia, the mortality being as low as about 14 per 1,000. I could not help the suspicion that there was a fallacy somewhere, and, as you know, had begun collecting information before I left Adelaide to return home. By your kindness I obtained a set of the returns of the vital statistics of South Australia for a few years back, and proceeded to analyse these with the hope that something useful might result.

So far as I can judge from the rather incomplete newspaper report of the discussion which followed the reading of my paper, there had scarcely been sufficient heed given to the saving clauses which it contained.

The first part of the paper was taken up with an endeavour to arrive at some conclusion about the nature and extent of the fallacy which I supposed to exist in the estimate given in the annual report of the Registrar-General, that the death rate of Adelaide and suburbs had been only 14·34 in 1885, and 14·31 in 1886. The first and most natural supposition was that the population had somehow been over estimated, and this was confirmed by the circumstance that the calculated birth rate had come down in about the same proportion as the death rate. Both reductions would meet with their explanation on the supposition of an over estimate of the population; while sanitary improvements, capable of lowering the death rate, could scarcely be supposed to influence the birth rate unfavourably and in about equal degree. The number of the population must always be to some extent uncertain at periods remote from the previous census year, and, as was very distinctly brought out at the census of 1881, there is always a special liability to over estimate the number. Then there was the undoubted fact that South Australia had been passing through a period of serious depression, leading to an excess of departures over arrivals. The number of persons leaving by sea cannot be known with certainty, and there can be little accurate information about those crossing the border.

Without claiming absolute accuracy for its results, I believed that by taking the number of births as a fixed basis, it would be

possible to reckon back to the true population rate. I admitted the fallacies to which the method was liable ; but, failing a proper census, I do not know of any other method of checking the results obtained by adding to the population of the previous year the births and deducting the deaths.

I was aware that the deep sewer system had not been extended to the whole area embracing Adelaide and suburbs, and the discussion, as to the population and death rate, was purely of a technical kind ; it was for the statistician, pure and simple, and not for the practical sanitarian. When the inquiry came actually to be as to the probable influence of the drainage system on the public health, it was necessary to limit it as closely as possible to the population within the drained area. I knew that the whole of the *City of Adelaide* had been drained, but the detailed returns of causes of death were not given for the city separately, and if the inquiry was to be continued at all, I had no choice but to take the returns for the *registration district of Adelaide*. I had no means of knowing the area of that district ; and though it was apparent that its population was greater than that of the city, it was also certain that the city population formed the large majority. It was a fair assumption that any cause (*e.g.*, drainage) which affected to an appreciable extent the health of the large majority would make that effect to be seen in the total. Clearly there were fresh possibilities of error introduced ; but I could only use the figures at my disposal, and these were for the *Adelaide registration district*. I would not have been so much inclined to place confidence in the reduced mortality from typhoid in that district in 1885-86, as tending to show the beneficial influence of the drainage, but for the fact that there had been no similar reduction in other districts of South Australia, rather a slight increase, as shown in table of my paper. Though the proportion of deaths from diarrhœal diseases had also been reduced, I did not feel warranted in laying much stress on that circumstance, as it was capable of explanation in another way, viz., the smaller number of infants, who supply the chief victims of these diseases.

But it may be said, if the subject was surrounded with such difficulties, and if the conclusions arrived at had to be so carefully guarded by saving clauses, why did I meddle it all? In reply, I can only plead that the subject was a very interesting and important one. If further put on my defence, I would have to say that in the first instance the question was not raised by me, the claim being openly made that the mortality in Adelaide had been reduced to about 14 per 1,000, as a result of the adoption of the drainage system. But, after all, it must be admitted that I had another object in view. Here, in Melbourne, we are in the

throes of discussion as to the desirability of forming a Metropolitan Board of Works, with power to take in charge the drainage of the city and suburbs, and I was anxious to find whether evidence of a reliable kind could be obtained from your experience which could be adduced in support of that measure. As the discussion could best be followed up by the members of your Royal Society, I ventured to bring the paper before them, and I am gratified to learn that my endeavour, which was at least well meant, had been met in such a friendly spirit.

On the Effect of Deep Drainage on the Rate of Mortality in Adelaide and Suburbs.

By H. Whittell, M.D.

[Read December 6th, 1887.]

At the last meeting of the Society a paper by Dr. Jamieson was read on the effects of deep drainage on the mortality of Adelaide and suburbs. On that occasion I made some comments which the Council has been good enough to request me to reduce to writing, with a view to their being read at this meeting as an introduction to a discussion which it is believed will be of interest to most members of the Society.

It will be remembered that in dealing with his subject Dr. Jamieson adopted two methods of investigation.

First—He compared the returns from the Registration Office of the population and deaths in Adelaide and suburbs during periods just before and just following the completion of the drainage.

Second—He drew a comparison of the mortality from special forms of disease (typhoid fever and diarrhœal diseases) with the mortality from other diseases occurring during the same periods in the registration district of Adelaide.

The conclusions, on the whole, were favourable to the system of deep drainage, and those of us who advocate the extension of the system might accept them without comment, if it were not that our silence might be misconstrued, and leave us open to the charge of accepting a favourable conclusion, although we know that the premises are incorrect. I have examined the doctor's figures with some care, and although I am at one with him in his conclusions, I cannot accept his calculations as having any important bearing on the subject of discussion. In saying this I wish it to be understood that I have a high appreciation of Dr. Jamieson's qualifications for the task he undertook, and also of the neighbourly interest he has manifested in his endeavour to assist us in determining a question which is of some importance to the whole of the Australian colonies. The errors into which the doctor has fallen are due to a want of knowledge of our localities, and to no other cause.

Referring to the first series of figures, in which the ratios of mortality in Adelaide and suburbs are compared during periods

just before and just following the completion of the deep drainage, the doctor says that he finds a sudden fall from an average during the old system of 21·38 per 1,000 population to 14·34 in 1885 and 14·31 in 1886, the latter two being the years since the new system was completed. The doctor questions the accuracy of these figures, and gives reasons for the inference that the official estimate of population for the last two years is incorrect. By a method of calculation explained in his paper he arrives at the conclusion that the population of Adelaide and suburbs was over-estimated to the extent of about 26,700 in 1885 and of 43,100 in 1886, or in other words, that when compared with 1884 Adelaide and suburbs lost in 1885 as many as 23,290 of its population, and in 1886 a further number of 15,019, making in two years a loss of about 38,300—*i.e.*, nearly one-third of the estimated population for 1884. I need but remind you that if a population be over-estimated the rate of mortality per 1,000 will appear to be less than it really is, and the locality will stand out as better from a sanitary point of view than places where the estimate is more correctly made. Having satisfied himself that Adelaide and suburbs is over-estimated, and having worked out other figures for himself, Dr. Jamieson calculates the rate of mortality on the basis of his new figures, and he arrives at the conclusion that according to his first mode of comparison the deep drainge has produced some slight diminution in the rate of mortality. I leave the question of population for the present because, although important, it need not be discussed in connection with the objection I have to make against any conclusions either for or against deep drainage being drawn from the doctor's calculations. The fundamental error into which Dr. Jamieson has fallen is the assumption that the drainage area and the area of Adelaide and suburbs are co-extensive. In 1885 and '86 the only places served by deep drainage were Adelaide, Hindmarsh, and Thebarton. "Adelaide and suburbs," as explained in the Registrar's report for 1886, means Adelaide and places within a radius of ten miles of it. This area includes Adelaide, Hindmarsh, and Thebarton, but it also includes Port Adelaide, Norwood, Kensington, Unley, Goodwood, St. Peters, Mitcham, Burnside, Glenelg, Semaphore, Crafers, Prospect, and other smaller towns, none of which, except a small part of St. Peters and Kent Town is connected with the deep drainage. The population of Adelaide and suburbs in 1884 may be set down in round numbers at 123,500; that of the drained part was about 52,300. It is therefore obvious that any calculations on the effect of drainage based on the returns for Adelaide and suburbs can only be inconclusive and misleading. I fear that the Registration Office must take some part of the blame for Dr. Jamieson's mistake. The published returns were

clear enough for South Australians, but the distinction between Adelaide and suburbs was not sufficiently marked for strangers. I noticed this a few months ago, and in the last three quarterly reports the form of the return has been altered so that no further error can occur.

Coming on to Dr. Jamieson's second mode of calculation, that in which a comparison is drawn between the mortality from typhoid fever and diarrhœal diseases and the mortality from other diseases occurring in the same period, I agree that such a comparison is fair and legitimate, and in the absence of disturbing factors the conclusions drawn from it afford a fair indication of the sanitary condition of localities to which the test is applied. A glance at the figures shows that the doctor has spent much valuable time in the preparation of this part of his paper. In the comparison he now undertakes he discards the Adelaide and suburban population because, as he explains, he could find no guide to enable him to make out what registration districts are in the Adelaide and suburban area. He therefore falls back on the registration district of Adelaide, which he supposes to correspond closely with the area efficiently provided with sewers. I regret that want of local knowledge has again led the doctor into fatal mistakes. Registration districts are arbitrary divisions of the colony made for the purpose of affording facilities for registration, and without reference to any other requirement. Once formed, they cannot be altered without introducing confusion and probably mistakes into official records. The Adelaide registration district has no relation to the drainage area. It includes Adelaide, Parkside, Unley, Mitcham, Mount Lofty, Belair, Brighton, Reedbeds, Salisbury, Stirling East, Walkerville, Glen Osmond, Dry Creek, Plympton, and many little townships scattered around the places I have named. Adelaide is the only town in the district that is within the drainage area. The other drained towns—Hindmarsh and Thebarton—are not included. The objections to the doctor's first series of calculations tells therefore with even greater force against the second, and I believe that if we could have the pleasure of Dr. Jamieson's attendance he would be the first, after the explanation I have given, to tell us that his figures furnish no guide to the determination of the question he undertook to discuss.

Here I might close my remarks on Dr. Jamieson's paper, but a rather long portion of the contribution is given to a discussion of a subject collateral to the main question but having an indirect bearing upon it. The doctor notes the record of the sudden fall in the ratio of mortality in Adelaide and suburbs from 21·21 per 1,000 in 1884 to 13·34 in 1885 and to 14·31 in 1886, and he endeavours to show by a mode of calculation of his own

that there is an error in the official figures, and that the population for the latter years was over estimated. This remarkable fall in the ratios has attracted the notice of others. Mr. Hayter, in publishing the figures in the Victorian Year Book, appended a note suggesting that the area to which the respective figures referred had been altered. This was also the opinion of some gentlemen in Adelaide. Others supposed with Dr. Jamieson that the population was over estimated. I became Registrar-General in 1885, a few months after Mr. Cleland, my predecessor, had calculated and published the estimated population for that year. At the year's end when the ratios were calculated, and this falling off in the rate of mortality became apparent, my first impression was that the population for the year had been set down at too high a rate. Against this I had the knowledge that Mr. Cleland had been familiar with the vital statistics of South Australia from the early times, that his calculations had stood the test of census returns as well as, and perhaps I should be correct if I said much better than, those of the statisticians of other colonies, and that an error on his part was improbable. This did not prevent an investigation. I soon found that Mr. Hayter's surmise was incorrect, there had been no alteration in the area. Two changes had, however, occurred in the early part of 1885, either of which might affect the estimate. The first change was made in the office. Up to the end of 1884 Mr. Cleland published his returns of local population in accordance with the census of 1881, without taking into account any increase or decrease of numbers after the census was taken. This was stated at the head of some of the quarterly returns, but on examining the figures I find the statement was not strictly accurate. That part of the table which referred to Adelaide city was evidently based on an estimated population of the whole area of Adelaide and suburbs, and every one who knows anything about vital statistics will agree that this was a wise and proper change to introduce. He not only did this, but he calculated the back years, and prepared a uniform table of results so as to furnish a means for comparison. This was a delicate operation, in which an error might easily creep in. It was on these new estimates that the ratios for 1885 were cast, and it was in this year that the lessened mortality commented on by Dr. Jamieson was recorded. Since my appointment to the office of Registrar-General Mr. Cleland has explained to me his mode of calculation, and I can only say that after a prolonged examination of such data as were available I could find no error which would have justified me in putting aside the figures which Mr. Cleland had so carefully prepared. In preparing the estimate for 1886 we both agreed that it would not be safe to follow the usual mode

of calculation, and a reference to our returns will show that we made only such a trifling addition at the beginning of 1886 as our altered circumstances appeared to warrant. The second change, in 1885, was more important. In that year, for the first time within my knowledge, the emigration from South Australia largely exceeded the immigration, and this continued to be the case during the whole of the following year. In 1885 the excess was 6,581. In 1886 it was 7,927. These were the losses by sea. We have no means of knowing the increase or decrease of population by land, but we shall probably be near the mark if we set down 15,000 as the total loss of the colony during two years by excess of emigration. As a matter of fact we did not suffer a diminution of population, because the excess of births over deaths during those years as nearly as possible balanced our loss. All this was taken into account and dealt with in our estimates for the whole colony; but when we come to the estimation of local populations, our difficulties begin. In hard times there is a constant migration of the people from one place to another. Men travel to any part of the colony when there is a chance of obtaining work, and the estimate of numbers in any one locality can only be regarded as approximate. Until a new census be taken it will be impossible to guarantee a strictly accurate return.

Dr. Jamieson suggests a mode of estimating local population which he thinks would be more reliable than that usually followed. He proposes to make the number of births in a given period the basis for calculation. His method of proceeding from the known to the unknown is this—we know that in the census year there was a certain population, say in Adelaide and suburbs; we know also that in the same year there was a certain number of births. If we want to get an approximate estimate of the population in any future year, we have only to take the births during the year, and assuming there is a fixed relation between the births and population, we can estimate from the births what the population for that year ought to be. In other words, supposing that in the census years it required 24 people to produce one baby, we have only to multiply the births in any other year by 24 and the product will give us a fair estimate of the population. It will occur to you that the accuracy of the result must depend so much on other factors that this mode of calculation cannot be accepted as reliable. We want to know something more about the 24 people. How many of them are children. How many unmarried, and of those that are married how many have the depressed times separated—the wife being left in charge at home while the husband is far away working, or seeking work, to support his family. In a normal steady-going condition of society Dr. Jamieson's method might give fairly accurate results,

but in this colony, subject to all sorts of fluctuation, I should be reluctant to adopt it. Let us take the city of Adelaide as a test. In the census year, 1881, the population was in round numbers 38,500; the births were 1,380. Assuming that the births are a safe index, the population fell in 1882 to about 34,000. In the next year, 1883, it bounded up to 39,000. It remained the same in 1884, and in 1885 it fell to 35,000. Those of us who reside in Adelaide know full well that there were no such upward and downward leaps as those indicated. Nothing occurred in 1881 to 1882 to justify the belief that Adelaide lost 4,500 people, nor was there anything in 1882 to 1883 to account for the sudden addition of 5,000.

The question still remains—Have we at present any data to enable us to determine the effect of deep drainage on the public health? I use the words at present advisedly, because I believe we shall have to wait several years before we shall experience the full benefits which our improved system will confer on us. Those who have made Adelaide their home will remember the condition of things. A few years ago Adelaide could properly be described as a city of stinks. There were hundreds of privies with cesspools that were simply holes in the ground, and from these the subsoil was saturated with filth of the most offensive kind. The only escape for house-slops was into the public gutters; and we all remember the abominable pools of filthy liquids which existed from one end of the city to the other. Deep drainage has put an end to these nuisances, but it has not removed from the subsoil the filth which has been accumulating there for years. There is a common idea that earth is the great purifier for excretal matters, and so it is if there be plenty of vegetation to use up the material, but without vegetation the earth soon becomes saturated, and afterwards the changes become so slow that it is difficult to know when the dangers arising from this earth-poisoning will end. Two or three years ago there were some extensive alterations being made at the back of a drapery establishment in Rundle-street. One of these required the excavation of earth for a large underground warehouse. One morning the contractor called at the Board of Health Offices and invited me to go down to this work, where I should find something to interest me. When I went there I found that a long excavation had been made from the back of the Rundle-street shop in a direction towards North-terrace. Just at the back of the shop there had formerly been an old privy, with a cesspool behind it. This had not been used for several months, having been emptied and filled up as required by the Hydraulic Department when connection was made with the sewers. The excavation had brought to view a long wedge-shaped mass of earth below the surface, differing in

colour from the rest, several feet thick, just below the old closet, and tapering off towards North-terrace to a thickness of a few inches. The length was 24 feet, and any part of this, even at its apex, when removed had a fecal smell as distinct as though it had just been taken from beneath the cesspool. This was only a section, but the workmen told me that the whole part excavated had a similar layer of stinking earth. I could not learn how long this privy had been in use, but we can readily imagine the filthy condition of our subsoil when we remember that hundreds of similar cesspools have been in use in all parts of the city during some 20 to 30 years. All this pollution has to be paid for, the purification of such soil will be slow, and until it is effected we cannot fairly estimate the advantages of having adopted a cleaner system.

In dealing with figures it is easy to fall into mistakes, and the risk of this is increased when we have to draw conclusions from comparatively low numbers. But after making allowance for this and taking care to give the weight of any doubtful point against rather than in favour of the new system, I believe the experience of Adelaide, so far as it has gone, has been altogether on the side of deep drainage. At the time of the census the population of the city was about one seventh and a half of the whole colony. It is safe to assume that the ratio remained about the same down to 1884, and also that the Registrar's estimate of the city population for that year was correct. After 1884, the year when the city drainage was completed, the loss by excess of emigration, as we have already seen, was for the whole colony 15,000 during two years. The proportionate loss for the city would therefore be 2,000. The excess of births over deaths in Adelaide during this period was 1,077, leaving a net loss of say 1,000, but seeing that it is probable that the proportionate loss by emigration was greater in Adelaide than in other parts of the colony, we will assume that double this number represents the loss that actually occurred. This would reduce the Adelaide population to about 40,600. The Registrar's calculations of the ratio of mortality of Adelaide have been made and published during the last three or four years on two distinct bases. In one the number of deaths occurring in the city is compared with the estimated population. In the other the rate is calculated after excluding all deaths in hospitals and public institutions of patients who have not up to their illness been residents in the city. For our present purpose it is not of much importance which of these calculations we adopt. If we take the latter, the ratio of mortality during two years (1883 and '84) was about 20·4 per 1,000; the ratio for the two years since the deep drains were completed, calculated on the assumption that the population fell to 40,600, was 17·6. If we take the first method the average of the ratios

from the census to 1884 was 24·5. In 1885 and '86 the average was 21·5. This is a most welcome diminution. You will have noticed that in drawing this comparison I have not closely followed the official estimates, but have allowed a wide margin for adverse factors. I am not anxious to strain these figures beyond their legitimate use; we want a longer time and larger numbers before we can draw positive conclusions. Meanwhile we may fairly assume that the abatement of city nuisances, the speedy removal of filth from our premises, and the blessing of pure air, have produced the beneficial results we are entitled to expect from them, and that a large part of the remarkable reduction of mortality in Adelaide is due to the completion of our new system of drainage.

On some so-called South Australian Rubies.

By Professor E. H. Rennie, D.Sc.

[Read May 1st, 1888.]

As is well known, considerable controversy has arisen in Adelaide as to the nature of the red stones recently found in large quantities in the northern interior of South Australia, some stating that these stones are genuine rubies, others that they are spinelles, others that they are garnets, while others still imagine that they are something quite new. The latter notion has arisen chiefly, I think, from statements made that they are infusible and harder than garnets, though scarcely hard enough for rubies. It has often occurred to me that it is somewhat strange that so far no results of any chemical examination of these stones have been published, such an examination being, in my opinion, *the* crucial test of their nature. By the courtesy of various gentlemen some of these stones from three of the Companies, viz., McDonnell Ranges, Hale River, and Maude, have lately been placed at my disposal. Before stating the results obtained it may be well to state briefly the nature of the various minerals above alluded to, viz., rubies, spinelles, and garnets, and to show that they differ widely from one another in chemical composition.

1. *Rubies.*—These consist essentially of alumina, but there may be present small quantities of impurities, especially magnesia and silica.

2. *Spinelles.*—These consist essentially of an aluminate of magnesia, but there may be present, according to Dana, from about $1\frac{1}{4}$ to $5\frac{1}{2}$ per cent. of silica, with occasionally considerable quantities of lime and oxide of iron.

3. *Garnets.*—These vary greatly in composition, but are in all cases silicates. I have only been able to find two cases in which the silica is below 35 per cent., and in those cases the percentages are about 34 and 31 respectively. They may be silicates of lime and alumina, of iron and alumina, of magnesia and alumina, of manganese and alumina, of lime and iron, of lime and chromium, with varying small quantities of other constituents.

To come now to the results of analysis. All the specimens I have examined have proved to be silicates of alumina and iron, with small quantities of oxide of manganese, lime, and magnesia, and hence are undoubtedly garnets, as Mr. Streeter says, "of the Almandine variety." The following are the quantitative results obtained by the analysis of some of the stones from the Hale River :—

Silica (SiO_2)	38·48	per cent.
Alumina (Al_2O_3)	27·09	"
Ferrous oxide (FeO.)	26·28	"
Lime (CaO)	1·99	"
Magnesia (MgO)	4·20	"
Oxide of manganese (MnO) ...	·35	"
	98·39	

In this analysis all the iron has been reckoned as protoxide; in all probability some is present as peroxide, and this would account for the low total. Another sample from the Maude Company yielded 39 per cent. of silica, with large quantities of alumina and oxide of iron, and smaller quantities of lime and magnesia.

A word or two now with reference to hardness and infusibility. First, with reference to hardness. Unfortunately I have no reliable specimens at hand with which to test hardness; but let us take for granted that the hardness of some of these stones is 8, and that is, I understand, the highest that has been given. Dana, one of the greatest, if not the greatest, mineralogical authority, places the hardness of garnets at from 6·5 to 7·5. Between the latter number and 8 there is a very small margin, and no one with any knowledge of the great difference in physical properties produced by comparatively small variations in chemical composition will lay any stress upon this small excess of hardness. In connection with this it may be noted that the analyses above given show rather larger proportions of alumina and less of oxide of iron than are contained in most of the specimens of this variety of garnet, analyses of which are given by Dana, the silica being about the same. It is quite possible that this slight difference in composition may account for the increased hardness. Then as to alleged infusibility. Very much depends upon the method of testing. These stones will not fuse if they be tested by the blowpipe as they are found, but let them be powdered first, and the powder fuses easily into distinct globules. This will never happen with true rubies or spinelles.

In conclusion, it must be understood that my statements relate only to those specimens handed to me, which, however, I am assured are representatives of the vast majority of stones sent to Europe. It would be rash to say that no rubies have been found. Further, I have brought this matter before the Society simply as of some little scientific interest, and my remarks must not be taken as having any reference to the value of these stones. What they are worth from a commercial point of view I cannot say; it may be much or it may be little.

An Automatic River Gauge.

By Thomas Parker, C.E.

[Read July 3rd, 1888.]

Since the reading of my paper on "Underground Waters" before the Society last year, in which I drew attention to the great need of a systematic gauging of the rivers and streams of this colony, I am glad to learn that the Government have given instructions for this work to be undertaken.

During the course of my labours in gauging one of our rivers by the usual method, I was led to attempt some improvements on the existing system of taking such observations, and as a result, have designed an automatic river gauge. My object in this paper is to give a description of the invention, the method of using it, and also point out what I think are its advantages in point of economy and efficiency.

I will first briefly describe the present methods of gauging rivers.

The usual methods of gauging rivers are—(1) By current meter, and (2) by a weir and graduated scale. The first method is that generally used for large rivers where a weir does not exist or is not easily erected. It is now being used by the various colonies in gauging the River Murray. It is a portable instrument, and so constructed that on being dipped in the stream the working parts are caused to revolve by the flow of the water, and the velocity of the river flow is indicated by the number of revolutions made and indicated by the instrument. This velocity applied to the sectional area of the stream at the point where the observations are taken enables the observer to calculate with sufficient accuracy the volume of water discharged by the river in a given time.

The second method, namely, gauging by means of a weir erected on the river, is usually applied to smaller streams, and it is to the improvement of this method my invention is intended to be applied. In this case a weir is erected across the river, and a lath set up marked off in inches and decimal parts, and readings of the height of the water above the sill of the weir are taken from time to time, and from these, by the aid of the usual hydraulic formulæ applicable to the stream, the quantity of water passing over the weir at any particular time may be calculated. The great drawbacks of this system are its inefficiency and costliness.

The instrument I have designed consists of a copper float which rises or falls with the water in the stream in which it floats freely; attached to this float is a rod carrying a pencil which is pressed by a spring against a cylinder on which is fixed a sheet of graduated recording paper. Inside the cylinder is placed clockwork to turn it on its vertical axis, and constructed to go fourteen days. As the cylinder is turned by the clockwork the pencil attached to the float marks the height of the water on the paper graduated to inches and decimal parts. The whole of the apparatus is intended to be enclosed in a wooden case and attached to a post driven into the bed of the river and fenced round for its protection. The instrument is designed on a principle similar to that of instruments for recording automatically other kinds of observations, but, so far as I know, no previous instrument has been designed for river gauging.

The following are the advantages of the instrument:—

1. *Efficiency.*—The record of the instrument will be continuous day and night. The present system of taking such observations say, only twice a day, is very imperfect, as in the intervals floods may come down the river and pass the gauge unrecorded, and, in this way, all present river gaugings are more or less inaccurate.

2. *Economy.*—As pointed out, this gauge can be fixed on a stream and left in operation, and only requires to be visited once in fourteen days; for this reason the expenses of an official in constant attendance can be dispensed with. As to the cost of the instrument, a leading instrument maker of Adelaide has estimated the cost at about twenty pounds.

3. *Saving of Time.*—This instrument, if adopted, would facilitate the important work of gauging the flow of water in our rivers, as, by fixing an instrument on each stream, a large number can be gauged simultaneously; in fact, the work could be carried on with accuracy and inexpensiveness, and the records collected and sent in as regularly as our rainfall observations are now taken throughout the colony.

I will only add that I have handed over my invention to the Government of this colony, with the hope that it may be utilized by them in the important work which has now been undertaken of taking gaugings of the flow of our streams in South Australia.

Preliminary Notes on a New Australian Mammal.

By E. C. Stirling, M.A., M.D., Lecturer on Physiology in the Adelaide University.

[Read September 4, 1888.]

A few days ago, through the kindness of Mr. A. Molineux, of Adelaide, a small mole-like animal, which appears to be new to science, was forwarded to the South Australian Museum. It was found on the Idracowie Cattle Station at a distance, I understand, of about 100 miles from the Charlotte Waters Telegraph Station, on the overland line from Adelaide to Port Darwin, but the exact circumstances of its capture are not yet to hand. The collector, however, reports that it must be of rare occurrence, as on questioning the aboriginals of the locality, there was only one old woman who said she had seen it before, and that upon a single occasion. It is evidently an underground burrowing animal, resembling somewhat the Cape Mole (Chrysochloris) in its general external appearance, but differing in many respects. The total length is 13 cm., inclusive of the tail, which is two cm. long. The head, relatively shorter than Chrysochloris, has a rounded muzzle, the dorsal surface of which is covered by a horny shield. Nostrils transversely slit-like. No eyes visible, the skin passing uninterruptedly over the ocular region, but on reflecting the skin in one side of the face a small circular pigment spot is visible on the position of the eye. No apparent bony orbit. Tongue fleshy, broad at the base and tapering to a blunt point. No external ears, but the ear-openings distinct, one mm. wide, and covered over with fur. The fore limbs are short, resembling somewhat those of a mole, but the manus is folded, so that the large nails of the fourth and fifth digits only are visible in the natural position of the limbs. Of these nails, the fourth is 15 mm. long, and of a uniform width of four mm., ending very bluntly ; the fifth is very slightly shorter than the fourth, broad at the base (eight mm.), tapering rapidly to a blunt point, the two together forming an outline rather like that of a goose-mussel (Lepas). The nails of the third, second and first digits, very much smaller, form a series gradually diminishing in size in the order named, and constitute a second row on the inside of the fourth and fifth, by which, as stated, they are completely concealed from view. What

corresponds to the palm is the cleft between the two rows of digits. The hind limbs are also short, with the soles turned outwards. What appears to be the fifth (anterior) digit is very short, with a short, broad, and strong nail; the fourth is armed with a long (seven mm.), narrow, curved, and sharp claw; while the claws of the third, second, and first are broad, flat, rounded at their points, and joined together by a membrane which extends nearly to their points. On the sole there is a hard, elongated, horny tubercle crossing it transversely. The tail, two cm. long and five mm. wide at the insertion, tapers to three mm., and terminates in a knob-like tip.

About 15 mm. in front of the vent (? cloaca) there is a pouch in the integument about 4 mm. wide with the opening directed backwards and having a depth in a forward direction of from 4 to 5 mm. The surface of this pouch is devoid of hair, but the bare area is surrounded by thick fawn coloured fur with a slightly reddish tint. It is, however, possible that this reddish tint is due wholly or in part to some ferruginous looking sand which is much mixed up with the fur. The body generally, with the exception of the lower two-thirds of the tail, which is bare, is covered with fur of a rather lighter tint.

With regard to the internal parts, it is unfortunate that the specimen came to us completely eviscerated and in a bad state of preservation generally, but in a small part of the lower bowel which was left remains of ants were found. The bowel terminates at a wide vent (? cloaca) and I can find no trace of a separate genital aperture, nor of such openings into the supposed cloaca.

I have not yet had time to examine with minuteness the skeleton, which unfortunately is also considerably damaged, especially about the occipital region, but from a cursory examination of the recently skinned body I can note the following points, with, I believe, accuracy:—Cranium relatively large; no bony orbits; zygomatic arches present. Well developed shoulder girdles with slender clavicles. Pectoral muscles large. Pelvis large and strong, with a rather wide pubic symphysis, but no epipubic bones either actual or rudimentary. Ribs, 14. Angle of lower jaw markedly inflected. The teeth are peculiar, and require a more extended description than I can give at present, but the formula appears to be i. $\frac{3}{3}$, c. $\frac{1}{1}$, m. $\frac{6}{6}$ ($\frac{\text{p. } 2, \text{m. } 4}{\text{p. } 1, \text{m. } 4}$); this however may require some modification, as just posterior and external to the præmolar (or first molar) of the right ramus of the mandible there is a small rudimentary conical tooth which is not to be found on the opposite side or at corresponding positions in the maxilla.

Until a more extended examination has been made of the skeleton and teeth of this animal, I purposely abstain from ex-

pressing a definite opinion as to its nature and affinities, and the following remarks must be taken as provisional only.

Though the integumentary pouch and marked inflection of the angle of the mandible point to its marsupial nature, there is no trace, even in a rudimentary form, of epipubic or marsupial bones, which are nearly always present in the marsupialia. On the other hand, the absence of a separate urgo-genital orifice (if this should be confirmed) suggests that it is a new member of the order Monotremata, of which the Platypus and Echidnas are the only known representatives. The characters of the manus and pes, the well-developed shoulder girdle and relatively large pectoral muscles, together with the absence or extremely rudimentary condition of the eyes, are plainly suggestive of the subterranean, burrowing, and probably nocturnal habits ; while the character of the teeth and the actual contents of what little there was left of the lower bowel prove it to be insectivorous in its feeding.

The dentition is certainly remarkable, and both in the shape of the mandible and in the general characters of the teeth there appears both to Mr. Zietz and myself a strong resemblance to the pictures of the fossil jaws of the extinct Amphitherium figured in the works of Owen and others. If this resemblance should be confirmed by closer examination, the discovery of this animal, apart from its mole-like characters, will be of high zoological interest, inasmuch as these jaws of Amphitherium found in the lower Oolite at Stonesfield, in Oxfordshire, associated with the remains of Plesiosaurs and Pterodactyls, are among the earliest remains of the class Mammalia known to the geologist.

On the interesting points which are raised by this supposed resemblance it is, however, unsafe to speculate at present, nor, as will have been seen, are we yet in a position to define with certainty its relation to existing types. I merely submit to the Society these preliminary and necessarily incomplete notes in deference to the interest which has been excited by the announcement of the discovery of this very interesting animal, singular even in this land of curious and antique types.

To Mr. Zietz, assistant Museum Director, I am much indebted for valuable assistance in the preparation and examination of the specimen.

Since the above notes were in type, Mr. A. Molineux has been good enough to forward me an extract from a letter recently received by him from his nephew, Mr. Charles Benham, who originally found the animal. Mr. Benham writes as follows :— "I found it during daylight about 4 p.m., on a big sand hill. I tracked it for about fifteen yards, but saw no burrow. It would crawl or walk a few feet, and then scratch a very small hole, then go on again and scratch another hole. There was no known

water within ten miles of the place where it was found, but there is a prickly bush with water in its roots growing on the sand hills. The animal seems to be very scarce, as this is the first that has been seen by white men about here, and there was only one old black woman who said she had seen it before. She called it by a name which sounded like "Aurachamater." I did not notice any pouch.

Notes on the Surface Features and Rocks of Nuriootpa and its Neighbourhood.

By J. G. O. Tepper.

[Read April 3rd, 1888.]

Nuriootpa, a small township on the eastern boundary of the Hundred of Nuriootpa, is on the banks of the North Para River. Almost level flats surround it, extending eastward to the foot of the Angaston Hills, which are an extension of the Barossa Ranges, culminating in Mount Kaiserstuhl, 1,980 feet. In this direction the width of the flat plain is about three miles. Westward the Greenock and Mappa hills bound it at a distance of one to two miles. Northward it extends to within a mile or so of Stockwell, and north-westwards still further for some six or seven miles, being finally blocked by the junction of the Kapunda and Truro hills. Southward it gently rises to a low ridge, at the western end of which Tanunda is situated, and descends rapidly to a lower flat, in which Betany is situated, and through which, in a transverse direction, *i.e.*, east to west, Tanunda Creek flows. From here the same formation of the ground is repeated—that is, the flat between the river, which here, as far the greater part of the way from Nuriootpa to Tanunda, skirts the hills on the western side—and the ranges to the east gradually rise, crossed by a number of deeply-excavated creeks, until gradually terminated by spurs from the eastern hills. Beyond these spurs the same feature is again repeated where intersected by the Pewsey Vale road ; but the flat is now divided into two by a narrow range of hills stretching in a curve from north to south chiefly. The eastern flat is at first narrow, containing at the foot of the steep first hills a small permanent lagoon of oval form, and about ten acres in extent. Beyond a narrow low ridge formed by a spur from the last-mentioned hill, the flat widens, and contains the shallow Hoffnungs lagoon of irregular form and an area of about 120 acres. The southern end of this flat is traversed by a creek some seven or eight feet above the level of the lagoon, and finally narrowing to about one-sixth of a mile, joins the Lyndoch Valley flat.

To the west of the range of hills just mentioned, and at the northern end, the flat is interrupted by a somewhat rapid descent of about 200 feet to the Lyndoch Valley, which is a nearly level

flat some four or five miles long by about a mile to two miles wide, through which a rather large creek flows, and which in former times was famous for its great fertility of soil.

The hills, dividing the two flats or wide valleys as well as those on east and south, consist of micaceous and hornblendic schists, and show here and there remarkably steep inclines. Those on the west are much younger, and exhibit ferruginous shales and conglomerates. Spurs extend far into the flat here and there. The soil of the latter is on the surface, near the centre a black tenacious clayey mould, but much more sandy nearer the margin. Below this i s a dense extremely sticky grey or white clay, with numerous fantastically-formed calcareous concretions. This changes into sandy ferruginous loam, with lime nodules, which has not been pierced by wells at a depth of 70 to 80 feet; but near the southern extremity, at 40 feet and less, pure sand and coarse gravel was reached, bearing fresh water. These various flats present semblances of the bottoms of a chain of lakes drained by the bursting or wearing away of comparatively narrow barriers of hard rocks, and the flat at Lyndoch shows these features of such lacustrine origin much more conclusively than the larger and less hill-bound ones.

The surface soil in the flat at Nuriootpa township along the course of the river is a rich black mould many feet in thickness; farther to the north a more or less adhesive clay prevails, as likewise towards the east from Nuriootpa. The township itself stands upon a fertile sand, gradually merging into the sandhills west and north-westward. South and south-east more or less loose, either fertile or almost barren sand prevails to within a mile of Tanunda. Below the sand and mould, which are of slight thickness at places or missing altogether, follows first a yellowish, sandy, and gravelly clay, in many places sufficiently pure and plastic for bricks, and from 20 to 40 feet or more thick. Underlying this and occasionally rising to the surface is a white and blue very adhesive clay, here and there stained deep rusty, and which is remarkable on account of including layers of impure salt, which were first observed in a bank of the river towards Tanunda associated with thin hard layers of a ferruginous cement, subsequently traced at various other places. No doubt this is the cause why so many saline springs exist along the river. Even the wells become brackish and finally undrinkable in those areas which have this formation. As no fossils have been found the age is doubtful, but I think may be assumed to be either the latest Tertiary or early Pleistocene. The thickness seen varied from about two feet to over five, but as this was near the edge of the basin it must be much thicker in the middle.

Under the blue clay follows a white, yellow, or red sandstone,

porous and water bearing, but of unknown thickness, nor is it known what is below it, as at a depth of, I believe, about 200 feet reached by boring near the hotel in search for kerosine or coal, the base rock was not reached. The river crosses the flat obliquely east of the township, no where showing rocks in the bed, but instead has mostly boggy banks on account of the many springs, usually weak and some saline in summer. An old bed, now broad and shallow, winds through and west of the township, joining the river where it approaches the western hills. Its watershed on this side is very close, only from half a mile to two miles distant, and skirting it, an interrupted band of the well-known "IRONSTONE" occurs, probably marking the edge of the former lake, but is wholly absent on the eastern side. In structure it varies from that of a real sandstone finely and evenly grained to a coarse conglomerate of pebbles three to six inches in diameter. Sometimes cavities, as if shells had been removed, are found in it, but no fossils were ever seen here, except a fragment of wood converted into brown hæmatite, found S.W. of Tanunda.

Where undisturbed and developed to a considerable extent the uneven surface is homogeneous, but with occasional round holes penetrating deeply and allowing the water to flow off. Its thickness is nowhere exceeding two feet.

A very interesting rock is a very hard grey sandstone grit, which here and there is found fringing low ridges. It consists of pure grains of semitransparent quartz cemented by silica of the same character and inclosing a few larger pebbles but rarely. Sparingly dispersed occur tortuous holes, as if formed by worms. This rock is from 18 inches to three feet thick, rests on red clay, and is sometimes overlain by the ironstone. A similar but more jaspery rock occurs on the hillsides near Sheaoak Log, showing numerous root-like enclosures.

The older rocks in the eastern as well as the western hill ranges consist of micaceous and hornblendic schists, gneiss, quartzites, and near Greenock granite. The last is intrusive at and near the anticline, which is at a high angle. It outcrops only near the base of depressions, but never on the heights. The principal place observed is in the north-east corner of section 1817, near Greenock, and indications in section 208.

The strike of the old pre-silurian rocks varies a few degrees beyond the magnetic and true north and south, while the dip is usually at very high angles. At Angaston, in a small quarry near Mr. Salter's residence, the hornblendic strata are undulating, and the dip varying between 48° and 65° *westerly* (strike N., 7° W.). Similar strata near Greenock, in the cutting of the road, gave a similar strike, but a dip of 62° to 68° easterly, while

that of the west side of the anticline was 77° westerly. The protrusion of the granite is in the line of strike of this anticline and northward. Near this place cyanite, a rather rare mineral, is found in quartz veins. A fine grained, very hard white sandstone occurs in sections 554 and 683, forming a bank-trending nearly east and west, cleaving into almost right-angled blocks, and quite local. Magnesian limestone and a seam of very hard kaolin were noticed near Moppa, and a vein of baryta on the road near Greenock.

At Tanunda, between sections 43 and 38, the river has broken through quartzites, sandstones, and micaceous slate, which probably was the original barrier above which the waters of the upper lake were confined. By the strike o f intervening masses of similar rocks they appear as a continuation of those forming the highest ridge between Greenock and Nuriootpa. Another barrier, very thick, occurs north of Jacob's Creek, and beyond Rowlands Flat the banks of the river become high and precipitous, attaining from its sharp south-easterly bend for several miles an elevation of about 200 feet. The base is formed of the old rocks dipping at steep angles, mostly easterly, The greater part above is formed of conglomerates, gravels, clay, and sand. At the ford at Both's Mill, sections 560 and 1806, and farther past the village at Rosenthal, clay slates, frequently very fine grained and fissile, come in and reach to the summits of the hills, rising 200 to 300 feet above the river bed, and narrowing it extremely. The gradual wearing through these hills obviously opened a way for the escape of the waters accumulated over the Lyndoch Valley.

Above the clay slates, and intercalated with them, occur thinner or thicker seams of crystalline limestone, mostly of a bluish or grey tint, and also iron spar, with perfect cleavage, is met with. In the bed of the creek, about section 1700, a perfectly black coarse slate is found locally, and in section 1692 a dyke occurs of volcanic or pseudo-volcanic rock, being formed of large and smaller angular fragments united by a homogeneous cement. It is traceable in the direction of its strike, south-west and north-east, for several hundred yards, and has a width of 20 or 30 yards. In the neighbourhood also occur jasper and chalcedony in large blocks, now no longer to be seen *in situ*, but removed for road metal or lying along the fences. About section 806 the highest point is reached for this part, called Schoof's Hill. It is composed of a highly indurated silicious slate rock, with very imperfect cleavage, flanked eastward by a ridge of soft micaceous slates.

North of this, in sections 101 and 102, this limestone assumes large proportions, forming a hill, on which the Wheal Nitschke Copper Mine was worked.

The surface soil of all these hills is a deep brown or red clay, very fertile ; in fact, a great part is the famous Bay of Biscay soil. Here and there, where thin, it is mixed with stones, the fragments of the base rocks. The higher ridges are usually crowned by soft travertine in patches, gradually broken up, removed, and the ground turned into wheatfields.

Of the above rocky and hilly character is all that eastern part of the district of Nuriootpa between the river in the east and Rosenthal in the south, and the Nuriootpa Flat and Daveyston in the north, developing further on into the Mappa Hills north-eastward of Greenock and the Belvidere Ranges west, the whole of this part of the district—besides the very narrow strip along the river—being drained by the Salt Creek and the smaller New Mecklenburg Creek. The former having received its name from the saline character of its numerous small but permanent springs in the lower two-thirds of its course.

At the foot of this hilly region in the west extends a wide flat, the surface formed of red or yellow clay, and below of the same kind of sandy calcareous loam or marl, forming the precipitous banks of the Torrens at the Botanic Bridge. It dries loose in ummer, deep cracks forming in many parts, and when heavy showers give rise to sudden floods deep crevices are formed in a short time.

West of this flat, which formerly was almost wholly covered by dense mallee growth of which but small remnants are left, the land rises into gentle undulations, the surface covered by red clay and Bay of Biscay ground. The neighbourhood of the river, is flanked by hills of the old rocks on both sides, while the summits and sides bear mostly the same covering of red clay.

Notes on the Muddy Creek Beds, with brief Remarks on other Tertiary Strata of South Western Victoria.

By John Dennant, F.G.S., Corr. Memb.

[Read October 2nd, 1888.]

PLATE I.

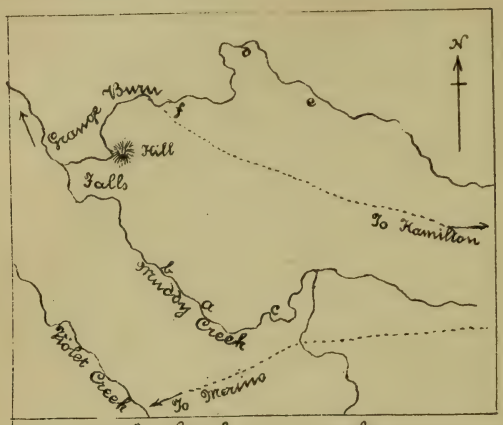
I. Introduction.

Perhaps there are no fossiliferous deposits in Australia which have been more frequently visited than the Muddy Creek beds, not only by geologists, but also by those led thither by curiosity merely. Their short distance from Hamilton, the beauty of the scenery, the ease with which the fossils can be obtained, and last, but not least, the warm welcome accorded to visitors by the proprietors of the land where the beds are situated, combine to make Muddy Creek an especially pleasant place for a day's outing.

Up to the present time, however, no attempt has, I believe, been made to describe the strata, though the fossils themselves have engaged the attention of our ablest palæontologists. Many years ago, the Rev. J. T. Woods worked industriously at the beds, and to him we are indebted for a knowledge of a large number of the most characteristic forms found in them. Subsequently, Professor Tate spent some time at Muddy Creek, and made an extensive collection of fossils, including many new species. Since then, owing to the labours of various collectors, the material awaiting description has been gradually accumulating. A perusal of the Transactions of this Society for the last few years will show that Professor Tate has made great progress in dealing with it, especially of late, in his systematic revision of the Australian Tertiary Mollusca, three instalments of which have already appeared. In the Prodromus of the Palæontology of Victoria, Professor McCoy has published excellent drawings and descriptions of about 35 species found in the Muddy Creek beds. Descriptions of many species have also been given by the Rev. J. T. Woods, F.G.S., in the Transactions of the principal Scientific Societies of the colonies.

Nor have the English geologists been behindhand in the interest taken in these and other Australian Tertiary deposits, the Quarterly Journal of the Geological Society containing valuable memoirs upon the Corals and the Echinodermata by Professor M. Duncan, and upon the Bryozoa by Mr. A. W. Waters, F.G.S.

Fig 1. Map of Grange Burn & Muddy Creek
Scale: 1 mile to 1 inch



a = nodule bank. d - porphyry outcrop
b = Clifton bank e - Forsyth's
c = Mc Donald's bank. f - outcrop of lower beds on Grange Burn

W.

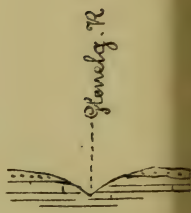
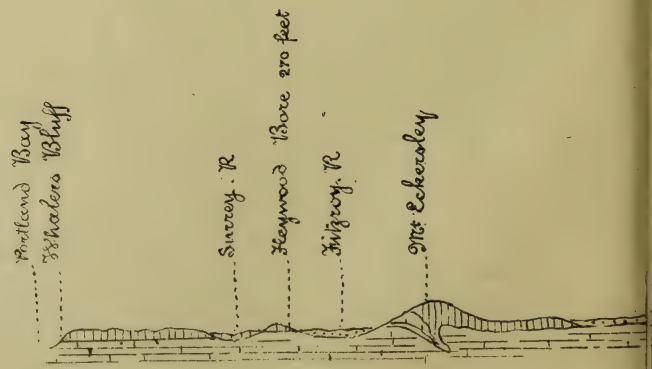


Fig. 2. Diagram Section fr
(Approximate. horizontal

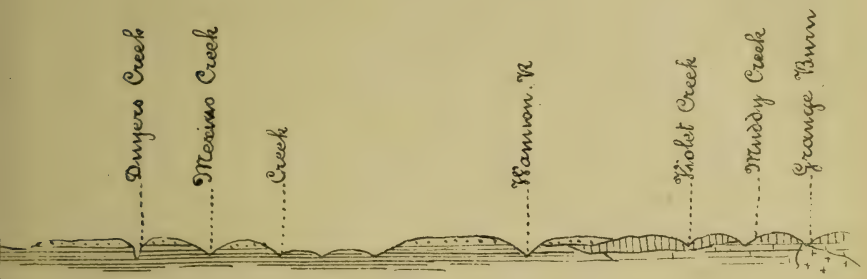
S. S.W



Palaeozoic
Quartz porphyry
Mesozoi

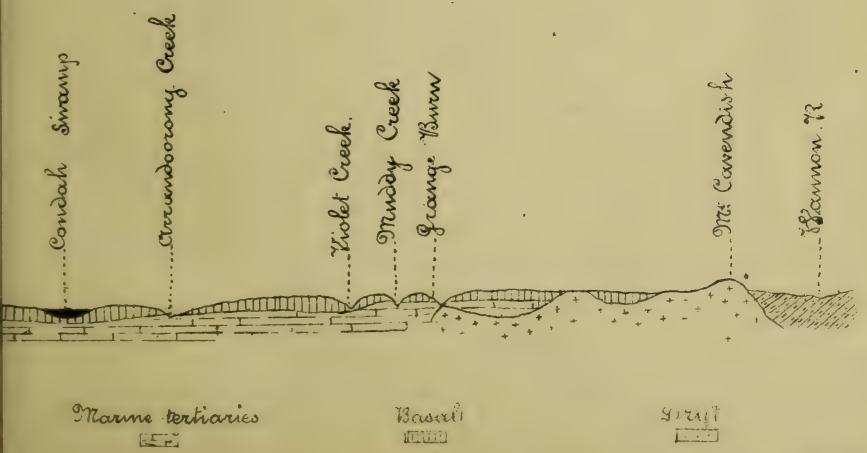
3. Diagram Section from Grange Burn to Glenelg R
Approximate horizontal scale 8 miles to 1 inch

E.



River Hannon to Portland Bay
e ; 8 miles to 1 inch)

N. E



My remarks in this article will refer principally to the position of the beds, to their relation to adjoining strata, and to the difference in geological age, which I conceive to exist between certain portions of the shell deposits. As full a list of the Mollusca as can be made out at present will be added, as necessary for the illustration of the point last named.

In its course towards the Wannon, the Grange Burn is joined by two tributaries, viz., Muddy Creek and Violet Creek. Although all three are insignificant streams, and confined now in narrow channels, yet the valleys through which they flow are not only wide, but depressed considerably below the level of the surrounding country. I have not observed any fossil outcrops in the Violet Creek, which is the more remarkable, as they occur in so many places in both the Grange Burn and Muddy Creek.

It may be mentioned here that the term "Muddy Creek" beds is used by common consent, as a convenient name for the whole series of fossiliferous strata in this locality, and must be understood, therefore, to include not only the deposits of Muddy Creek itself, but also those of the Grange Burn, close at hand.

The distance of Muddy Creek from the sea is about 40 miles, while the fossil-bearing strata (in the place marked "*a*" in the map) are 385 feet above sea level. Mr. S. Mason's house on the table-land overlooking the creek is 130 feet higher, or 515 feet above sea level. This may be regarded as the general elevation of the country in the neighbourhood, the slope to the sea-coast being very gradual. These and the other levels given later on are aneroid measurements of my own. The meteorological station at Hamilton, about five miles distant, which is exactly 640 feet above sea level, has been adopted as the starting point for the observations made in the neighbourhood of Muddy Creek. In other localities, either the sea itself, or some known elevation, has formed a basis to work from.

Going northwards from the Grange Burn, no outcrops of the marine tertiaries occur in the whole of the county of Dundas, except a small outlier towards its extreme western boundary, on the margin of the River Glenelg. This region, lying between the Grange Burn and the Wannon on the south, and the Glenelg on the north, forms a plateau, occupied by palæozoic, granitic, trappean, and metamorphic rocks, and probably stood at too great an elevation during tertiary times to be submerged.

To the north and north-west of the Glenelg, however, the marine beds again appear, and continue almost without interruption over a vast extent of country, the river in this part of its course marking a well-defined geological boundary.

By going along the Grange Burn to the westward, we soon lose sight of the tertiaries, the mesozoic strata—which they, no

doubt, immediately overlie in that direction—appearing as the surface rocks. The intervening country between the tertiary and the mesozoic outcrops is occupied by basalt and drift accumulations, so that no actual junction of the two formations can be found. A little to the west of Merino, however, I have gathered casts in ironstone of characteristic Muddy Creek shells in the immediate vicinity of the underlying secondary rocks. Further west still, on the Glenelg River, the mesozoic strata entirely disappear, the marine tertiaries alone being visible, not only to the border of the colony, but far beyond it. These deposits are, in fact, found only as a fringe on the eastern, southern, and western margins of the mesozoic area, its central and northern portions showing no signs of them, and it is doubtful, therefore, whether the formation, as a whole, was ever covered by the tertiary sea.

It has been thought by some geologists, whose opinions are entitled to great respect, that the mesozoic beds pass under the tertiaries right down to the coast, and also for long distances both to the east and west. There appear to me to be some objections to this theory, which I will now state.

1. There is no outcrop whatever of mesozoic strata in the whole of south-western Victoria, except in the limited area of the Wannon Valley.

2. The shales, sandstones, and silicious limestones, of which the secondary beds consist, are either horizontal or nearly so, wherever I have examined them, while in order to pass, as supposed, completely out of sight under the tertiary beds, they would require to assume all at once a high inclination. Thus, near Merino, the mesozoic strata are found at an elevation of 396 feet above sea level, while on the cliffs of the Glenelg, only a few miles to the west, a thickness of more than 100 feet of the tertiary strata is exposed, the river having hollowed out its channel to a great depth below the general level of the country. Here there is no sign of the mesozoic strata, which we should certainly expect to find if such horizontally disposed beds extended far in a westerly direction. Again, at Heywood (see section, fig. 2), the tertiary strata have been bored into, to a depth of 190 feet below sea level, in searching for water, without discovering any change in the formation.

3. The mesozoic strata are, I believe, of no great thickness in this part of Victoria, and, therefore, not likely to prevail over a wide area. The rocks underlying them, viz., micaceous, quartzose, and felspathic schists (the so-called metamorphic rocks of the district), crop up at no great depth in two localities known to me, one of which is about eight miles north of Coleraine, in the bed of the Koroite Creek, towards the northern margin of the formation, and the other, at about its centre, on the banks of the Wannon, near the Winninburn homestead.

To the south, south-west, and south-east of Muddy Creek, the tertiary beds crop out in various places, as at Branxholme, Arrandoovong Creek, Byaduk, Lake Condah, Mount Eccles, Heywood, Bessiebelle, Portland, &c., and it may therefore be affirmed with tolerable certainty that the formation is continuous at no great depth below the surface right down to the coast. From the various localities mentioned, fossils have been obtained, many of which I have examined. Between the Grange Burn and the sea, several lava flows, more recent than any of the tertiary deposits, conceal the sedimentary strata, but when wells have been sunk, a layer of shells has usually been met with at a moderate depth.

On the east of the Muddy Creek beds, the country is so completely covered by lava, that the underlying strata are invisible, and I can offer no opinion as to the extension of the tertiaries in that direction.

The shell deposits of Muddy Creek are seen in some places at a considerable height above the surface of the water, but in others, they appear to sink quite below the bed of the stream, and thus become invisible, reappearing perhaps at the next bend, high up on the bank. The difference in the level of the fossil sections is no doubt due, in a great measure, to the action of the creek itself, which, after working its way through the superincumbent basalt, and thus reaching the tertiary strata, has eroded them also, carrying away the more friable portions, and leaving minor depressions in their surface, which, in the course of time, have been filled up by the loose soil and boulders washed down from above. The gently sloping banks on the shores of Muddy Creek, where no fossil beds are in sight, have probably been formed in this way.

In one place, however, this stream flows over a mass of basalt in its bed, forming a miniature waterfall, and here the igneous rocks must be in their original position, which is a good deal below the level at which they are found, when seen in contact with the fossil outcrops close at hand, and their presence at such a depth can only be accounted for by supposing that the sedimentary deposits had been hollowed out prior to the igneous outflow. It should be noted that the tertiary strata are horizontal, not only at Muddy Creek, but throughout the whole of the district, so that any irregularity of their surface can only arise from denudation.

II. The Fossiliferous Beds.

In both the Muddy Creek and Grange Burn sections, the shells are usually embedded in argillaceous and calcareous bands, the colour of which varies a good deal, the former having often a

bluish tinge, while the latter are reddish, the depth of the tint depending upon the degree of oxidation of the iron they contain. Very fine and perfect shells are often found amongst the bluish-coloured clays, especially large volutes and cowries. The bands are horizontal, and though they no doubt indicate some slight difference in the deposition of the sediments, similar shells occur both in the blue clays and the red calcareous layers. It is true that some of the bands contain more fossils than others, but still shells can be obtained in a greater or less quantity in any part of the strata.

I have hitherto spoken of the fossiliferous strata of the Muddy and Grange Creeks as a whole, without indicating definitely the distinction as to age which undoubtedly exists among them. So far as the Muddy Creek itself is concerned, all the beds known consist of the clayey and calcareous layers already noticed, but in the Grange Burn, fossiliferous strata of a different character appear, which have not, I think, been referred to by any previous geological writer. They form a rather friable rock, composed mainly of bryozoan remains, with spines of echini, and occasional shells, chiefly pectens, scattered through it. In outward appearance, it resembles almost exactly the strata on the Crawford River, about half way between Muddy Creek and the south coast of Victoria. Somewhat similar strata are also found at Apsley, on the western boundary of Victoria, and also at Narracoorte in South Australia. Those at the last-named place are described by Professor Tate under the name of "polyzoal rock," which in his classification of the Australian Tertiaries he has placed as antecedent in age to the Muddy Creek shell beds. In one place only have I seen the strata in close proximity, and there the polyzoal rock appeared to underlie the shell beds. As, however, I was unable to trace their actual contact, I am not prepared to speak definitely on the point. As said before, this rock is nowhere visible in the Muddy Creek, but it abounds in the Grange Burn, not only above, but also for a long way below its junction with Muddy Creek. The identifiable shells in it are few, and these even are with difficulty extracted whole, so that its thorough examination will be a work of time. As my own labours, so far, have been almost entirely restricted to the shell-beds, I can do little more at present than direct attention to this interesting formation.

As is well known, geologists are not entirely in accord concerning the relative ages of the various tertiary strata of Victoria, South Australia, and Tasmania. Professor Duncan, judging from the evidence of the corals and echinodermata, advises that they should all be called cainozoic simply, without attempting further subdivision. The mollusca, however, tell a much more certain

tale, and prove clearly enough that several well-defined zones exist among the Australian tertiaries. The diversity of opinion as to the precise position of certain beds in the series is due, no doubt, in a great measure, to the partial manner in which they have been as yet explored. In the case of the Muddy Creek beds—the most important, perhaps, of the whole series—much confusion has arisen in the past from the mixing together of fossils obtained from two different members of the group.

It has long been known to collectors of Muddy Creek fossils, that certain species of shells occur only in special portions of the beds; but as some forms are common to all localities, the variation was thought to be less than it really is. Some observations lately made show, however, not only that the difference is a marked and constant one, but disclose also the important fact that the shells are different according as they are gathered above or below a particular elevation, sections of equivalent height yielding always the same species. When the fossils from the Grange Burn, at Forsyth's (see map), were placed side by side with those from Muddy Creek, at Clifton Bank, and the few species common to both outcrops removed, it became evident that two distinct deposits were represented.

Examples of the following species are numerous in the first-named place:—

Triton Quoyi
Nassa crassigranosa
sublirella
Marginella muscaroides
(aff.) ovulum
Ancillaria papillata
Cancellaria Wannonensis
Terebra catenifera
Natica gibbosa
Pelicaria coronata
Lampania rubricata
Nerita melanotragus
Leiopyrga cingulata
Ostrea manubriata
Mytilus Hamiltonensis
Nucula tumida
Leda acinaciformis
Limopsis Belcheri
Pectunculus cainozoicus
McCoyii
convexus
Trigonia Howitti
Crassatella oblonga
Chione subroborata
propinqua
Cytherea paucirugata
Dosinia Johnstoni
Meroe gibberula
Psammobia Hamiltonensis
Mactra axiniformis
Hamiltonensis
Corbula ephamilla *(var.)*

At Clifton bank there is a much greater variety of species, but, on the whole, fewer individual specimens. The more commonly occurring forms are:—

Murex lophœssus
Ranella Pratti
Triton Woodsii
Pusionella hemiothone
Pleurotoma perarata
Haastii

Triton textilis
tortirostris
Fusus craspedotus
Dennantia Ino
Nassa Tatei
Voluta antiscalaris
McCoyii
strophodon
Weldii
polita
sarissa
Lyria harpularia
Marginella Woodsii
propinqua
inermis
Winteri
Wentworthi
Ancillaria pseudaustralis
Entalis Mantelli
Cylichna exigua
Terebratula vitreoides
Waldheimia Garibaldiana
Dimya dissimilis
Pecten Murrayanus
Yahlensis
Lima Jeffreysiana
Spondylus pseudoradula
Leda vagans
Pleurotoma Claræ
Mangelia bidens
Clavatula fusilla
Daphnella gracillima
Conus Ralphii
pullulescens
Cypræa contusa
Murraviana
Trivia avellanoides
Cassis exigua
Semicassis transenna
Natica gibbosa
polita
Solarium acutum
Cerithium apheles
Liotia Roblini
Minolia strigata
Entalis annulatum
Limopsis Belcheri
Pectunculus cainozoicus
McCoyii
Cucullaea Corioensis
Trigonia semiundulata
Crassatella Dennanti
Cardita gracilicostata
Corbula ephamilla
Placotrochus deltoideus
elongatus

It is important to note the relative elevation of these outcrops. By aneroid observations, I make Clifton bank 385 feet, and Forsyth's bank 420 feet, above sea level, giving a difference of 35 feet in the heights of the two places.

From a comparison of the fauna in the two beds, and from other evidence to be adduced directly, I conclude that the deposit at Forsyth's belongs to a later epoch than that at Clifton. The two zones, which are now generally recognised, in the Muddy Creek shell beds are, in fact, well typified in these localities, viz., the upper or younger at the first, and the lower or older at the second.

It was on the Grange Burn that I first became convinced of the distinction between the two sets of shell beds, but the evidence at Muddy Creek is, in reality, far more conclusive, for there we are enabled to see their actual junction. At the Clifton section, only the lower beds are visible, but a few chains higher up the stream, the upper beds crop out just under the basalt, on the face of a steep bank. The upper half of this bank,

the total height of which is about ten feet, was cut down some years ago in searching for cetotolites and other cetacean remains, when a band of nodules and fragments of whales' bones, mixed with upper bed shells, was reached, but the strata then becoming hard, and apparently unproductive of fossils, the remaining portion was not uncovered. As I had seen lower bed shells in close proximity to this place, I employed a man to cut down the whole of the bank, and thus give a perpendicular section. The result was gratifying. The nodule band, which is only a few inches in width, proved to be the actual division between the upper and lower deposits. Above it, the most characteristic shells of the upper zone were found in profusion, beneath it, the species obtained were, almost without exception, those peculiar to the lower zone.

In the topmost strata, in addition to many other characteristic species, numerous and very fine examples of the following occur:—

Solen sordidus	Zenatiopsis angustata
Dosinia Johnstoni	Nucula tumida
Barnea tiara	Leda acinaciformis
Mactra axiniformis	Crassatella oblonga
Hamiltonensis	Cytherea paucirugata

The inferior beds are not nearly so well represented here as at Clifton Bank, and other places lower down the creek, the shells being fragile, and not very abundant. The following, amongst other typical forms, were collected immediately beneath the nodules:—

Voluta strophodon	Dimya dissimilis
antiscalaris	Leda vagans
Conus Ralphii	Trigonia semiundulata
Terebratula vitreoides	Lucina araneosa

The elevation of the nodule band is 410 feet above sea level. Farther up the stream, and therefore at a higher level, only the superior beds are in sight. From a fine outcrop of these (marked "c" on map), a large collection of fossils has been made, chiefly by Mr. McDonald, the result being the discovery of several new species peculiar to the upper zone, as—

Voluta Masoni	Eligmope Dennanti
Siphonalia spatiosa	Pecten subconvexus
Nassa sublirella	Triton ovoideus
Pelicaria coronata	Pectunculus convexus, &c.

The fossiliferous strata crop out almost continuously on the banks of Muddy Creek between this spot and the falls, but wherever examined, they are found to consist of either the upper or lower beds, according as they lie above or below the level of the nodule band.

The same can, I think, be said for the Grange Burn, but as, with the exception of the one quoted, the sections are not good, they have not offered the same attractions to the collector as the more productive ones of Muddy Creek, and are therefore not so well explored. I have on several occasions searched the banks of this stream from Forsyth's down to the junction, gathering shells wherever they could be found. At one place, the height of which is 390 feet above sea level, and thus 20 feet lower than the nodule band, I dug out a tolerable number of shells, but they were in so fragile a condition, that only a small proportion remained whole when touched. As the elevation led me to expect, the deposit proved to belong to the earlier formation, none but lower bed fossils being found. Amongst other characteristic forms collected may be mentioned—

Voluta antiscalaris	Leda vagans
strophodon	Lucina araneosa
Trigonia semiundulata	Cucullæa Corioensis
Lima Jeffreysiana	Placotrochus deltoideus

The section bears a very close resemblance to that immediately beneath the nodule band at Muddy Creek. Identical fossils occur, and in both the shells are comparatively scarce, as well as fragile.

The only place in which the nodule band is well seen is at the spot mentioned on the Muddy Creek, where it has been laid bare for a distance of about 30 feet along the face of the bank. Like the beds which it divides so sharply, it is horizontal, while its width varies little, if any, right across the section. As it is only about six feet above the water's edge, it cannot be traced much farther either *up* or *down* the stream, since in the first case, it soon passes under the bed of the creek, as this rises with the slope of the ground, while in the latter, both it and the beds overlying it have been removed by denuding agencies, the lower beds alone cropping out as the altitude decreases.

On the Grange Burn, at about an equal elevation, similar nodules, whales' bones, &c., are found in the actual bed of the stream, and though the layer is much thicker than at Muddy Creek, it probably belongs to the same deposit. The Grange Burn layer is the favourite hunting place for sharks' teeth, which are so numerous in it that one man lately obtained as many as 30 by a few hours' work. Other curious remains are fairly abundant at the same place, as ear bones, vertebræ, and snout bones of whales, fish palates, &c. These are sometimes mineralised, but not unfrequently the bony structure is well preserved.

The nodules themselves are rolled fragments of many sizes and shapes, but all more or less rounded. Their colour, which is dark-

brown, is due to the iron they contain. Enclosed in them, as an essential part of their mass, there are minute pieces of shells, and an abundance of foraminifera, the presence of the last pointing to their derivation from the lower beds. Dr. J. E. Taylor, F.G.S., who visited Muddy Creek with me, was much interested in these nodules, saying they reminded him of the so-called coprolite beds at the base of the Red Crag in Suffolk, and advised me to test them for phosphates. A specimen was accordingly analysed, but the phosphoric acid amounted only to 11·9 per cent., the main ingredients being carbonate of lime, ferric-oxide, and alumina.

In the following summary and table of species belonging to the respective beds, I have taken account only of the Mollusca proper. The brachiopods, pteropods, and, with one or two exceptions, the bivalves mentioned have been described by Professor Tate, the Rev. J. T. Woods, and others. The gasteropods are, as yet, only partially described, and I have to thank Professor Tate for permission to quote his manuscript names for a large number of them. The list is not exhaustive, as there are many species yet to be examined. As some species are only known from examples obtained before the distinction between the two deposits was recognised, and the fossils from each kept separate, it is not possible to refer them to the particular bed in which they occur, until fresh specimens are found, and they are, therefore, for the present, merely recorded as Muddy Creek shells.

I. Summary of Species.

Classes.	1. No. of Species peculiar to lower beds.	2. No. of Species peculiar to upper beds.	3. No. of Species common to both beds.	4. No. of Species not referred to a particular bed.	Total.
Cephalopoda	3	0	0	0	3
Gasteropoda { Siphonostomata ...	209	53	8	19	289
Gasteropoda { Holostomata	83	45	6	13	147
Gasteropoda { Opistho-branchiata ...	9	1	0	2	12
Pteropoda	3	0	0	0	3
Brachiopoda	10	0	1	0	11
Lamellibranchiata	69	43	15	1	128
Total	386	142	30	35	593

II. List of Mollusca found in the Muddy Creek beds.

O, older (lower) beds; Y, younger (upper) beds; ?, O or Y (column 4 of summary).

Beds in which found.	Name of Species.
	CEPHALOPODA.
O	Sepia sp.
O	Aturia australis, *McCoy*
O	Nautilus sp.
	GASTEROPODA.
O	Typhis McCoyii, *T. Woods*
O	disjunctus, *Tate*
O	laciniatus, *Tate*
O	evaricosus, *Tate*
O	Murex velificus, *Tate*
Y	trinodosus, *Tate*
O	didymus, *Tate*
O	lophœssus, *Tate*
O	Dennanti, *Tate*
O	amblyceras, *Tate*
O	irregularis, *Tate*
O	Hamiltonensis, *Tate*
O	asteriscus, *Tate*
O	pachystirus, *Tate*
O	Eyrei, *T. Woods*
O Y	trochispira, *Tate*
O	alveolatus, *Tate*
Y	crassiliratus, *Tate*
?	camplytropis, *Tate*
O	asperulus, *Tate*
O	Trophon polyphyllus, *T. Woods*
O	brevicaudatus, *Tate*
Y	sp.
O	Rapana aculeata, *Tate*
O	Vitularia curtansata, *Tate*
Y	Ricinula subreticulata, *Tate*
Y	Purpura abjecta, *Tate*
O	Ranella Prattii, *T. Woods*
Y	Triton ovoideus, *Tate*
O	Woodsii, *Tate*
O	gibbus, *Tate*
O	cyphus, *Tate*
O	textilis, *Tate*
O	intercostalis, *Tate*
O	annectans, *Tate*
O	protensus, *Tate*

Beds in which found.	Name of Species.
O	Triton tumulosus, *Tate*
O	tortirostris, *Tate*
O	gemmulatus, *Tate*
Y	Quoyi, *Reeve*
O	Epidromus tenuicostatus, *T. Woods*
?	leptoskeles, *Tate*
?	citharellus, *Tate*
O	texturatus, *Tate*
O	turritus, *Tate*
O	Fusus bulbodes, *Tate*
O	aciformis, *Tate*
O	hexagonalis, *Tate*
Y	dumetosus, *Tate*
O	dictyotis, *Tate*
O	simulans, *Tate*
O	foliaceus, *Tate*
O	acanthostephes, *Tate*
O	craspedotus, *Tate*
O	senticosus, *Tate*
O	henicus, *Tate*
O	Fasciolaria Tenisoni, *T. Woods*
O	exilis, *Tate*
O	decipiens, *Tate*
?	cristata, *Tate*
O	cryptoploca, *Tate*
O	rugata, *Tate*
O	fusilla, *Tate*
O	Peristernia lintea, *Tate*
Y	approximans, *Tate*
O	succincta, *T. Woods*
Y	purpuroides, *Tate*
O	interlineata, *Tate*
O	subundulosa, *Tate*
O	Sipho labrosus, *Tate*
O	crebrigranosus, *Tate*
O	asperulus, *Tate*
O	styliformis, *T. Woods*
O	Pseudovaricia mirabilis, *Tate*
O	Siphonalia subreflexa, *Tate*
O	longirostris, *Tate*
Y	spatiosa, *Tate*
Y	sp.
?	sp.
O	Tudicula turbinata, *Tate*
O	angulata, *Tate*

Beds in which found.	Name of Species.
O	Dennantia Ino, *T. Woods*
Y	Pisania rostrata, *Tate*
Y	semicostata
Y	obliquecostata, *Tate*
O Y	brevis, *Tate*
O	purpuroides, *Johnston*
Y	Cominella crassina, *Tate*
O	Eburna aulocœssa, *Tate*,
O	Zemira præcursoria, *Tate*
O	Phos variciferus, *Tate*
?	tardicrescens, *Tate*
Y	tuberculatus, *Tate*
O	cominelloides, *Tate*
O	Nassa Tatei, *T. Woods*
Y	crassigranosa, *Tate*
Y	sublirella, *Tate*
O	Voluta antiscalaris, *McCoy*
O	sarissa, *Tate*
O	McCoyii, *T. Woods*
Y	Masoni, *Tate*
O	Hannafordi, *McCoy*
O	McDonaldi, *Tate*
O	strophodon, *McCoy*
O	Weldii, *T. Woods*
O	costellifera, *Tate*
O	Mortoni, *Tate*
O	ancilloides, *Tate*
O	pseudolirata, *Tate*
O	crassilabra, *Tate*
O	lirata, *Johnston*
O	alticostata, *Tate*
O	conoidea, *Tate*
O	ellipsoidea, *Tate*
O	cathedralis, *Tate*
O	polita, *Tate*
O	Lyria harpularia, *Tate*
Y	gemmata, *Tate*
O	Mitra alokiza, *T. Woods*
O	dictua, *T. Woods*
O	Dennanti, *Tate*
Y	atypha, *Tate*
O	ligata, *Tate*
Y	conoidalis, *Tate*
O	atractoides, *Tate*
O	exilis, *Tate*

Beds in which found.	Name of Species.
O	Mitra semilævis, *Tate*
O	clathurella, *Tate*
O	paucicostata, *Tate*
O	escharoides, *Tate*
O	biornata, *Tate*
O	leptalea, *Tate*
O Y	terebræformis, *Tate*
O	othone, *T. Woods*
Y	cassida, *Tate*
Y	sordida, *Tate*
O	Marginella Woodsii, *Tate*
O	propinqua, *Tate*
O	Winteri, *Tate*
Y	muscaroides, *Tate*
Y	*aff.* ovulum, *Sow.*
O	micula, *Tate*
O	inermis, *Tate*
O	Wentworthi, *T. Woods*
O	cassidiformis, *Tate*
O	septemplicata, *Tate*
Y	sp.
O Y	sp.
O	Erato minor, *Tate*
O	Oliva angustata, *Tate*
Y	nymphalis, *Tate*
Y	Ancillaria papillata, *Tate*
O Y	pseudaustralis, *Tate*
O	sublævis, *T. Woods*
O	heberæ, *Hutton*
O	lanceolata, *Tate*
O	ampliata, *Tate*
O	Harpa lamellifera, *Tate*
O	tenuis, *Tate*
O	abbreviata, *Tate*
O	sulcosa, *Tate*
Y	Columbella bidens, *Tate, m.s.*
Y	fenestrata, *Tate, m.s.*
Y	vexans, *Tate, m.s.*
Y	tridens, *Tate, m.s.*
O	infans, *Tate, m.s.*
Y	pachychila, *Tate, m.s.*
O	cochleata, *Tate, m.s.*
O	cingulata, *Tate, m.s.*
O	nodulosa, *Tate, m.s.*
Y	unicarinata, *Tate, m.s.*

Beds in which found.	Name of Species.
O Y	Columbella atratæformis, *Tate*, *m.s.*
O	subspeciosa, *Tate*, *m.s.*
Y	cainozoica, *T. Woods*
O	semicostata, *T. Woods*
Y	Oxleyi, *T. Woods*
O	funiculata, *T. Woods*
O	clathrata, *Tate*, *m.s.*
O	oryza, *Tate*, *m.s.*
O	aciculata, *Tate*, *m.s.*
O	oligostira, *Tate*, *m.s.*
O	crebricostata, *T. Woods*
Y	bicarinata, *Tate*, *m.s.*
O	cominelloides, *Tate*, *m.s.*
Y	exoptata, *Tate*, *m.s.*
O	septemcostata, *Tate*, *m.s.*
O	Cancellaria epidromiformis, *Tate*
O	varicifera, *T. Woods*
O	laticostata, *T. Woods*
O	pseudaustralis, *Tate*
O	semicostata, *Tate*
O	capillata, *Tate*
O	gradata, *Tate*
Y	Wannonensis, *Tate*
Y	modestina, *Tate*
O	Trichotropis sp.
O	Pusionella hemiothone, *Tate*, *m.s.*
Y	Terebra catenifera, *Tate*
O	platyspira, *Tate*
O	simplex, *T. Woods*
Y	geniculata, *Tate*
Y	subspectabilis, *Tate*
Y	additoides, *T. Woods*?
O	truncata, *Tate*
O	Pleurotoma perarata, *Tate*, *m.s.*
O	Murndaliana, *T. Woods*
O	Haastii, *Hutton*
O	Claræ, *T. Woods*
?	hemipsila, *Tate*, *m.s.*
O	consutilis, *T. Woods*
O	Samueli, *T. Woods*
?	rhomboidalis, *T. Woods*
O	paracantha, *T. Woods*
O	Johnstoni, *T. Woods*
O	sp.
O Y	Drillia Trevori, *T. Woods*

Beds in which found.	Name of Species.
Y	Drillia columba, *Tate, m.s.*
?	stiza, *T. Woods*
O	integra, *T. Woods*
O	five species
Y	sp.
?	sp.
O	Mangelia bidens, *T. Woods*
O	six species
Y	sp.
?	three species
O	Bela sculptilis, *Tate*
O	pulchra, *Tate*
O	crassilirata, *Tate*
O	cancellata, *T. Woods*
O	Clavatula fusilla, *Tate, m.s.*
O	asperula, *Tate, m.s.*
O	texturata, *Tate, m.s.*
?	Clathurella sp.
O	two species
Y	sp.
O	Daphnella tenuisculpta, *T. Woods*
O	gracillima, *T. Woods*
?	fragilis, *Tate, m.s.*
O	(*aff.* gracillima)
?	inornata, *Tate, m.s.*
O	two species
Y	Borsonia marginata, *T. Woods* (Thala)
O	Raphitoma daphnelloides, *T. Woods* (Mitra)
O	Conus papillosus, *Tate, m.s.*
?	ptychodermis, *Tate, m.s.*
?	complicatus, *Tate, m.s.*
O	pullulescens, *T. Woods*
O Y	Hamiltonensis, *Tate, m.s.*
O	Ralphii, *T. Woods*
O	scalaris, *Tate, m.s.*
O	(*aff.* Hamiltonensis)
O	(*aff.* papillosus)
O	(*aff.* pullulescens)
O	Cypræa eximia, *McCoy*
O	gigas, *McCoy*
O	platypiga, *McCoy*
O	contusa, *McCoy*
O	leptorhyncha, *McCoy*
O	platyrhyncha, *McCoy*
O	Murraviana, *Tate, m.s.*

Beds in which found.	Name of Species.
Y	Cypræa Archeri, *T. Woods*
O	dorsata, *Tate, m.s.*
O	six species
O	Trivia avellanoides, *McCoy*
O	sp.
O	Cassis exigua, *T. Woods*
O	Semicassis transenna, *Tate*
Y	Muelleri, *Tate*
?	sufflata, *T. Woods*
O	Cassidaria gradata, *Tate*
O Y	Natica auriculata, *Tate, m.s.*
?	Wintlei, *T. Woods*
O	perspectiva, *Tate, m.s.*
O Y	gibbosa, *Hutton*
O	limata, *Tate, m.s.*
O	Hamiltonensis, *T. Woods*
O	polita, *T. Woods*
O	paludinæformis, *Tate, m.s.*
Y	Trochita calyptræformis, *T. Woods*
O Y	rhysa, *Tate, m.s.*
Y	Crepidula (*aff.* C. unguis, *Lam.*)
Y	sp.
O	Capulus turbinata, *T. Woods*
O	Hipponyx foliaceus, *Q. and G.*
Y	Amalthea conica, *Schum.*
O	Astele sp.
Y	Zizyphinus sp.
O	two species
O	Euchelus sp.
Y	sp.
O	Xenophora agglutinans, *Lam.*
O	Solarium acutum, *T. Woods*
O	ephamilla, *Tate*
O	Wannonensis, *T. Woods*
Y	Scalaria triplicata, *Tate, m.s.*
O	seven species
O	Cirsotrema, three species
Y	sp.
O	Crossea parvula, *T. Woods*
O	sp.
O Y	Turritella platyspira, *T. Woods*
O	sp.
?	sp.
Y	Mesalia sp.
O	Torcula Murrayana, *Tate*

Beds in which found.	Name of Species.
O	Siliquaria squamulifera, *Tate, m.s.*
O	Eulima Danæ, *T. Woods*
O	two species
O	Niso psila, *T. Woods*
?	Turbonilla (*cf.* T. Hoffmanni)
O	Actæopyramis sp.
Y	Pyramidella tridens, *Tate, m.s.*
Y	nisoformis, *Tate, m.s.*
Y	three species
O	sp.
Y	Odostomia curta, *Tate, m.s.*
O	two speeies
Y	two species
Y	Planaxis (*cf.* P. mollis)
Y	Pelicaria coronata, *Tate*
O	Cerithium apheles, *T. Woods*
O	eusmilia, *T. Woods*
O	crebarioides, *T. Woods*
O	Salteriana, *T. Woods*
Y	two species
O	Cerithiopsis, two species
O	Triforis Wilkinsoni, *T, Woods*
O	sulcata, *T. Woods*
O	planata, *T. Woods*
Y	Lampania rubricata, *Tate, m.s.*
Y	Rissoa chrysalida, *Tate, m.s.*
Y	two species
Y	Rissoina punctifera, *Tate, m.s.*
Y	two species
Y	Nerita melanotragus, *Smith*
O	Leiostraca Johnstoniana, *Tate*
O	Mathilda, two species
O	Astralium Flindersi, *T. Woods* ?
Y	Diloma crassilirata, *Tate, m.s.*
O	Liotia Roblini, *T. Woods*
O	two species
?	Cyclostrema carinata, *T. Woods*
O	sp.
Y	Phasianella, three species
?	Gibbula æquisulcata, *T. Woods*
O	Collonia infralineata, *Tate, m.s.*
Y	Clanculus princeps, *Tate, m.s.*
Y	Dennanti, *Tate, m.s.*
Y	sp.
Y	Trochocochlea antiqua, *Tate, m.s.*

Beds in which found.	Name of Species
O	Minolia strigata, *T. Woods*
O	sp.
O	Thalotia exigua, *T. Woods*
?	Elenchus sp.
O	Cantharidus, three species
O	Diala bulimoides, *Tate, m.s.*
Y	Turbo paucigranosa, *Tate*
Y	Etheridgei, *T. Woods*
Y	Eligmope Dennanti, *Tate, m.s.*
Y	Leiopyrga cingulata, *Tate, m.s.*
O	Trochus, eight species
Y	sp.
?	three species
O	Delphinula aster, *T. Woods*
Y	Haliotis nævosoides, *McCoy*
Y	Fissurella nigrita, *Gray*
O	malleata, *Tate*
O	Hemitoma occlusa, *Tate, m.s.*
O	Emarginula candida, *Tate, m.s.*
?	transenna, *Tate, m.s.*
O	cymbium, *Tate, m.s.*
O	Acmæa, two species
?	sp.
Y	Siphonaria, sp.
O	Chiton, sp.
O Y	Entalis annulatum, *Tate*
O Y	Mantelli, *Zittel*
O	acriculum, *Tate*
O	subfissura, *Tate*
?	Dentalium bifrons, *Tate*
O	aratum, *Tate*
?	lacteum, *Deshayes*
O	Cadulus mucronatus, *Tate*
O	Scaphander fragilis, *Tate, m.s.*
O	Tornatella scrobiculata, *T. Woods*
O	biornata, *Tate, m.s.*
?	Tornatina, two species
Y	Volvula, sp.
O	Ringuicula lactea, *Johnston*
O	Cylichna exigua, *T. Woods*
O	three species
O	Umbrella austrina, *Tate, m.s.*
	PTEROPODA.
O	Styliola Rangiana, *Tate*
O	Spiralis tertiaria, *Tate*
O	Vaginella eligmostoma, *Tate*

Beds in which found.	Name of Species.
	BRACHIOPODA.
O	Terebratula vitreoides, *T. Woods*
O	Waldheimia insolita, *Tate*
O	Tateana, *T. Woods*
O	Garibaldiana, *Davidson*
O	Corioensis, *McCoy*
O	Magasella compta, *Sow.*
O Y	Magasella Woodsiana, *Tate*
O	Terebratulina Scoulari, *Tate*
O	Davidsoni, *Etheridge*
O	Thecidium australe, *Tate*
O	Rhynchonella squamosa, *Hutton*
	LAMELLIBRANCHIATA
O	Ostrea hyotis, *Linn.*
Y	manubriata, *Tate*
O	Dimya dissimilis, *Tate*
Y	Placunanomia Ione, *Gray*
O	sella, *Tate*
O	Pecten Murrayanus, *Tate*
O Y	Sturtianus, *Tate*
O	Yahlensis, *T. Woods*
O	Foulcheri, *T. Woods*
O	polymorphoides, *Zittel*
O	Zitteli, *Hutton*
O	deformis, *Tate*
Y	subconvexus, *Tate*
O	Lima Bassii, *T. Woods*
O	linguliformis, *Tate*
O	Jeffreysiana, *Tate*
O	Limea transenna, *Tate*
O	Spondylus pseudo-radula, *McCoy*
O	Plicatula, sp.
O	Meleagrina crassicardia, *Tate*
Y	Perna, sp.
O	Pinna, sp.
Y	Mytilus Hamiltonensis, *Tate*
Y	linguatulus, *Tate*
Y	deperditus, *Tate*
O	Septifer fenestratus, *Tate*
O Y	Modiolaria singularis, *Tate*
O	Crenella globularis, *Tate*
Y	Nucula tumida, *T. Woods*
O	Atkinsoni, *Johnston*
O	Morundiana, *Tate*
O	Leda obolella, *Tate*

Beds in which found.	Name of Species.
O	Leda Huttoni, *T. Woods*
Y	acinaciformis, *Tate*
O	vagans, *Tate*
Y	prælonga, *Tate*
O Y	Woodsii, *Tate*
O Y	Limopsis aurita, *Brocchi*
O Y	Belcheri, *Adams & Reeve*
O Y	Pectunculus cainozoicus, *T. Woods*
O Y	McCoyii, *Johnston*
?	subtrigonalis, *Tate*
Y	convexus, *Tate*
O	Barbatia crustata, *Tate*
O Y	celleporacea, *Tate*
O Y	consutilis, *Tate*
O	simulans, *Tate*
O	pumila, *Tate*
O	Macrodon cainozoicus, *Tate*
O Y	Cucullæa Corioensis, *McCoy*
O	Trigonia semiundulata, *McCoy*
O	tubulifera, *Tate*
Y	acuticostata, *McCoy*
Y	Howitti, *McCoy*
Y	Crassatella oblonga, *T. Woods*
O	Dennanti, *Tate*
O	astartiformis, *Tate*
Y	Carditella polita, *Tate*
O	multilamella, *Tate*
Y	Mytilicardia compta, *Tate*
Y	Cardita pecten, *Tate*
O	compacta, *Tate*
O Y	scabrosa, *Tate*
O	gracilicostata, *T. Woods*
O	delicatula, *Tate*
Y	solida, *Tate*
Y	calva, *Tate*
O	Lucina leucomomorpha, *Tate*
O	projecta, *Tate*
O	araneosa, *Tate*
O	despectans, *Tate*
O	Cryptodon mactræformis, *Tate*
O	Diplodonta subquadrata, *Tate*
O	Sacchia suborbicularis, *Tate*
O	crepidulæformis, *Tate, m.s.*
Y	Kellia micans, *Tate*
Y	Pythina, sp.

Beds in which found.	Name of Species.
O Y	Montacuta sericea, *Tate*
O	Chama lamellifera, *T. Woods*
Y	Chamostrea albida, *Lam.*
O	Verticordia pectinata, *Tate*
O	Cardium Victoriæ, *Tate*
O	cuculloides, *Tate*
O	antisemigranulatum, *McCoy*
O	hemimeris, *Tate*
O	Chione dimorphophylla, *Tate*
O	cainozoica, *T. Woods*
Y	subroborata, *Tate*
O Y	propinqua, *T. Woods*
Y	Cytherea paucirugata, *Tate*
O	eburnea, *Tate*
Y	submultistriata, *Tate*
Y	Dosinia Johnstoni, *Tate*
Y	Meroë gibberula, *Tate*
Y	Tapes sp.
Y	Venerupis paupertina, *Tate*
Y	Tellina albinelloides, *Tate*
O	Masoni, *Tate*
Y	æquilatera, *Tate*
O	Stirlingi, *Tate*
Y	(*aff.* Arcopagia decussata)
Y	Strigilla australis, *Tate*
Y	Psammobia Hamiltonensis, *Tate*
O Y	æqualis, *Tate*
O	Donax Dixoni, *Tate*
O	Semele vesiculosa, *Tate*
O	Krauseana, *Tate*
Y	Mactra axiniformis, *Tate*
Y	Hamiltonensis, *Tate*
O	Howchiniana, *Tate*
Y	Zenatiopsis angustata, *Tate*
O	Thracia perscabrosa, *Tate*
Y	Myodora prælonga, *Tate*
Y	angustior, *Tate*
O	tenuilirata, *Tate*
O	australis, *Johnston*
Y	corrugata, *Tate*
Y	æquilateralis, *Johnston*
O	sp.
O Y	Corbula ephamilla, *Tate*
O	Neæra subrostrata, *Tate*
O	Panopæa orbita, *Hutton*

Beds in which found.	Name of Species.
Y	Solen sordidus, *Tate*
O	Solecurtus Dennanti, *Tate*
Y	Barnea tiara, *Tate*
O	Teredo Heaphyi, *Zittel*
O	Humphreyia lirata, *Tate*
O	Saxicava arctica, *Linn.*

A few fossils, abundant in the lower zone, but only known in the upper by an occasional rolled and worn example, are, I think, derived forms, and they have not therefore been noted in the above list as belonging to both beds, At the actual junction of the beds, owing probably to a partial reconstruction of the strata, there is for a small space, both above and below the nodule band, a slight intermingling of the characteristic species of the two zones. This is not noticeable with the larger shells, but was observed to be the case for the smaller forms by Professor Tate, when examining some parcels of fossiliferous earth, which I forwarded to him a few months ago. Professor Tate gives the following as the result of his siftings of the earth sent :—

"Working at the gatherings from the two beds I have so far found the following species in common :—

I. *Characteristic fossils of the upper bed passing down into the top of the lower series.*

Chione subroborata, small and rare.
propinqua, small and rare.
Pectunculus convexus, small and very rare.
Placunanomia Ione, small and very rare.
Marginella muscaroides, rare.
Leiopyrga cingulata, common but small.
Montacuta sericea, one perfect valve.
Rissoa, sp.

The following are doubtful constituents of the fauna :—

Ancillaria papillata, one rolled fragment.
Terebra geniculata, two rolled examples.
Phasianella, both species, rolled one of each.
Columbella tridens, one rolled.
Rissoina sp., one rolled.
Tellina æquilatera, one fragment.
Psammobia Hamiltonensis, one fragment.
Barnea tiara, one fragment.

II. *Fossils of the lower series passing to the upper series.*

Sacchia suborbicularis, one example, small.
Lucina despectans, one example, small.
Erato minor, several examples, worn.

Marginella propinqua, two broken and worn.
Natica polita, one worn.
Marginella Woodsii, one worn.
Oliva angustata, a rolled fragment.
Terebratulina Davidsoni, many, but all worn.

I am much inclined to reject those species which I have met with only rarely and in a rolled condition. . . Certainly the majority of the fossils obtained under the nodule band belongs to the lower fauna."

Amongst the nodules and bone remains, perfect examples of some of the stronger shells belonging to the upper beds are abundant, *e.g.*, *Crassatella oblonga*, *Chione subroborata*, *Natica gibbosa*, *Pectunculus convexus*, &c. Fragile shells are absent, though they are plentiful enough in the strata above. Lower-bed shells have not been noticed in the nodule band, which would seem to indicate that this was laid down, not when the deposition of the older beds ceased, but when that of the younger ones commenced. As said before, the beds both above and below the nodules are horizontal, so that there is here simply a gap in the succession of the tertiary strata.

A much larger number of species occur in the lower than in the upper beds, especially amongst the siphonostomatous univalves, while the brachiopoda are almost confined to them. It is generally admitted that their fossils could only have lived in seas warmer than those of the present coasts of Southern Australia. On the other hand, the shells of the upper beds indicate a nearer approach to the existing temperature of our waters. Bivalves and holostomatous univalves predominate in them, and though, as compared with the lower beds, the number of species is small, individual examples are usually more abundant. Omitting for the present the shells referred to in column 4 of the summary, the total number of species recognised in the lower beds is 416, and in the upper 174. Of these, 81 species in the lower, and 37 in the upper beds have not been fully examined. By deducting them, we get 335 species belonging to the lower, and 137 to the upper zone, which have received distinctive names, and which may therefore be regarded as authenticated species. In the lower beds five living species are known, viz. :—

Ostrea hyotis, *Linn.*
Limopsis aurita, *Brocchi*
Belcheri, *Ad. & R.*
Saxicava arctica, *Linn.*
Hipponyx foliaceus, *Q. & G.*

The percentage of recent to extinct forms is thus only 1·5, which would place the beds low down in the eocene division of the tertiaries.

In the upper beds the existing species amount to nine, eight of which are found in the Australian seas, viz. :—

Triton Quoyi, *Reeve*
Placunanomia Ione, *Gray*
Limopsis aurita, *Brocchi*
Belcheri, *Ad. & R.*
Trigonia acuticostata, *McCoy*
Chamostrea albida, *Lam.*
Nerita melanotragus, *Smith*
Fissurella nigrita, *Sow.*
Amalthea conica, *Schum.*

The percentage of recent shells in these beds is therefore only 6·5. which would assign them to the oligocene period. I doubt, however, if the percentage system of classification can be safely applied to either set of beds, while so many forms remain undescribed. In the lower zone nummulites occur, and its eocene character may possibly be confirmed by further exploration.

The geological age of the upper beds cannot well be estimated at present, since many species of mollusca obtained from them have yet to be critically examined. The general character of the shells is certainly against their belonging to so early an epoch as the oligocene, and I think it improbable that they are older than miocene. In the case of several, which have received distinctive names, their affinity to existing species is so great that hesitation is felt by palæontologists in separating them. In the following table, a list is given of the fossil and living species which are most closely allied. For fuller information the reader is referred to Professor Tate's description of the shells.*

Species Fossil in Upper Beds.	Living Analogues.
Murex trinodosus	M. Angasi, *Crosse*
Ricinula subreticulata	Purpura reticulata, *Q. & G.*
Purpura abjecta	P. textilosa, *Lam.*
Triton ovoideus	T. Bassii, *Angas*
Peristernia approximans	Trophon Paivæ, *Crosse*
Marginella sp.	M. ovulum, *Sow.*
Nassa sub lirella	N. lirella, *Beck*
Pecten subconvexus	P. convexus, *Q. and G.*
Mytilus Hamiltonensis	M. hirsutus, *Lam.*
deperditus	M. chorus, *Molina*
Cardita solida	C. bimaculata, *Deshayes*
Leda acinaciformis	L. crassa, *Hinds*
Mytilicardia compta	M. crassicostata, *Lam.*
Chione subroborata	C. roborata, *Hanley*
Meroë gibberula	M. Aliciæ, *Angas*
Venerupis paupertina	V. exotica, *Lam.*
Tellina albinelloides	T. albinella, *Lam.*
Cytherea paucirugata	C. rutila, *Hanley*

* Transactions Royal Society of South Australia, 1885-6-7.

Mactra Hamiltonensis	M. polita, *Chem.*
Solen sordidus	S. Sloanii, *Gray*
Barnea tiara	B. australasiæ, *Gray*
Terebra subspectabilis	T. spectabilis, *Hinds*
additoides	T. ustulata, *Deshayes*
Crepidula sp.	C. unguis, *Lam.*
Planaxis sp.	P. mollis, *Sow.*

It will be necessary here, for the sake of comparison, to refer briefly to some of the other marine tertiary deposits of Victoria.

On the shores of Port Phillip Bay, outcrops of such strata occur, amongst other places, at Mornington, between Mount Eliza and Mount Martha, and at Mordialloc, and fossils from both localities have been described by Professor McCoy in the Prodromus of Victorian Palæontology. As far as can be judged from the comparatively small number of species yet recorded, the deposits of Mornington are represented in the lower, and those of Mordialloc in the upper Muddy Creek beds.

At Portland Bay, and also on the Glenelg River, two sets of strata are exposed, viz., a lower one composed of friable limestone, in which brachiopods, echinodermata, and foraminifera are the prevailing fossils, and an upper one consisting almost entirely of oyster shells. Concerning the age of the former of these there is considerable difference of opinion amongst geologists, some contending that it is older than the Muddy Creek beds, while others regard it as younger.

The upper deposit, or ostrea limestone, has been noticed as a surface formation at various places, not only near the coast, but also for some distance inland, and it must at one time have extended over a wide area. The most interesting outcrop of it known to me is at the Whaler's Bluff, Portland, where its junction with the older formation is clearly seen. Rising from the water's edge, the latter, easily recognisable by the fossils it contains, reaches about 40 feet up the cliff, when the ostrea limestone appears resting upon it. This extends for the next 12 or 15 feet, and is there overlain by igneous rocks, which continue up to the summit of the cliff, a height of about 100 feet.

While exploring here a few months ago, I made the curious discovery that the two sets of strata are actually separated by a pebble band of a few inches in thickness, horizontally disposed, and distinctly traceable, not only on this cliff, but also on an adjoining one. The pebbles vary in size from a diameter of about one and a half inches to that of a few lines only. They are of a light-brown colour, and very irregular in shape, some being nearly circular, some flattened, and some elongated; the edges of all are, however, more or less rounded, from which it may be concluded that they are rolled fragments, just as the nodules at Muddy

Creek are. Their percentage composition is not uniform, but lime, alumina, iron, silica, and carbon dioxide, were found in all, though in varying proportions in different samples analysed. They differ from the Muddy Creek nodules in containing a smaller amount of iron and no phosphoric acid. Although the pebble bands of Muddy Creek and Portland Bay are thus in some respects unlike, they, nevertheless, mark a distinct break in the succession of the strata at both places.

The most abundant fossil in the Ostrea limestone is *Ostrea arenicola* (Tate), which is closely allied to *O. Angasi*, a living species. In addition, I have collected the following, chiefly from the exposures of the strata on the Glenelg cliffs :—*Pecten meridionalis* (Tate), *Mytilus chorus* (Molina), *Chthalamus stellatus* (Poli), *Placunanomia Ione* (Gray), *Zenatiopsis angustata* (Tate), of which all but the last are living species. The Ostrea limestone must either belong to the late miocene or early pliocene period, probably the latter, the next older formation being, I think, the upper Muddy Creek beds.

III. Associated Rocks and Thickness of Strata.

As mentioned in the introduction, we do not know what formation the great body of the tertiaries in south-western Victoria rests upon. Even at Muddy Creek, which cannot be far from their northern boundary, the fossiliferous beds have not been pierced, and what underlies them has yet to be discovered. A few years ago, two energetic fossil hunters determined to solve this question by sinking a shaft in the bed of the creek. Unfortunately, their geological knowledge was not equal to their enthusiasm, as they chose a spot quite near the top of the upper beds, so that though they went down a good distance, they never even reached the lower beds, many feet of which are exposed in natural section on the banks of the stream, a few chains farther down. I would venture to suggest that the work of piercing such important beds as these should be undertaken by the Survey Department of Victoria. Whether boring operations here, and in the neighbourhood, would be likely to lead to discoveries, which could be turned to profitable use or not, I cannot say, but the scientific value of the information gained would be great. I had some grounds for thinking, at one time, that the expense of sinking a shaft would be defrayed by the Ballarat School of Mines, a proposal to that effect having been at first very favourably received. In the end, however, other counsels prevailed, and it was decided that no funds were available for such a purpose.

It is true that, at many places on the Grange Burn, certain rocks appear just beneath the tertiaries, but they are of igneous origin, and have penetrated through some earlier sedimentary

formation. Lithologically, they are a quartz-felspar porphyry, consisting of a felspathic matrix, enclosing well-developed crystals of quartz and orthoclase. From the presence of these, the rocks have a characteristic speckled appearance, which is very marked on the surface of a fresh fracture. Their colour is various, the matrix and the porphyritic felspar ranging from white to a reddish-brown; the quartz is usually black when looked at in the mass of the rock, but in a microscopic slide it appears beautifully transparent, and polarizes with the most vivid hues. Orthoclase is the only felspar present, no plagioclase having been found in any slice prepared. In structure the rock is eminently prismatic. This is very plainly shown in several sections, but especially at the spot marked "*d*" on the map, where a series of nearly perpendicular, though short, columns extends right across the stream. At the margin of the bank, on either side, the porphyry is overlain by about 10 or 12 feet of the polyzoal rock, the junction of the two formations being very clearly marked, on account of their totally different character. The outline of the country in this place is irregular, and I am inclined to think that there must have been a trough or narrow depression in the porphyry before the deposition of the tertiary strata upon it. Resting upon the polyzoal rock is the basalt, and the stream, having cut its way through the two uppermost formations, has exposed the underlying trap, which now forms the bed of the creek. Higher up the stream, the upper beds lie immediately upon it, and fragments of the rock are occasionally unearthed when digging for fossils. These porphyries are unknown anywhere to the south of the Grange Burn, but they can be traced in a north-easterly direction from it for fully 30 miles. The width of the outcrop varies, but in the neighbourhood of the tertiaries the rock is seen only in the Grange Burn, there being no sign of it in any part of Muddy Creek, neither *in situ* nor as fragments among the fossil deposits. It is unlikely, therefore, that the porphyry would be met with in sinking below the bed of the last-named stream, and the question as to what the underlying formation really is has yet to be solved.

The presence of the porphyry aids in determining the thickness of the upper beds. As the Grange Burn is followed upwards, a point is reached where this rock just ceases to be covered by the tertiaries, the basalt instead resting immediately upon it. The elevation of this spot is 450 feet above sea level, and, therefore, 40 feet higher than the nodule band at the base of the upper zone.

No estimate can be formed as to the thickness of the remaining portions of the tertiary series, viz., the lower beds of Muddy Creek, the polyzoal rock, and the Portland beds. Near the top

of Mount Eckersley, at an elevation of 319 feet (see section, fig. 2), there is an outcrop of limestone, which I take to be an outlier of the Portland beds. By adding this height to the depth of the Heywood bore, 190 feet below sea level, we get a vertical thickness of 509 feet, but as the base of the formation is not then reached, it is impossible to say how much lower the strata extend.

The Muddy Creek tertiaries, and, for the most part, those to the south of them, right down to the sea coast, are overlain by basaltic rocks. On the Glenelg, and in the country to the west of it, these are absent, and the tertiaries there are sometimes seen on the surface, though they are usually covered by drift sand.

Many of the vents, through which the lava sheets have issued, are still represented by volcanic cones of moderate height, as Mounts Bainbridge, Pierrepoint, Napier, Eccles, Eckersley, &c.

The Portland Bay beds were probably covered by an outflow from the extinct crater at Cape Bridgewater. Some of the lava overlying the Muddy Creek beds may have come from either Mount Bainbridge or Mount Pierrepoint, extinct volcanoes about seven miles distant. A portion of it, however, was probably ejected closer at hand. Mention has before been made of the miniature falls over which the Muddy Creek flows, just before its junction with the Grange Burn. Here massive basaltic rocks extend right across the stream, completely concealing the fossiliferous strata, which do not appear again till the junction is passed. A few chains from the falls, on the north side of the creek, there is a low conical hill, with a ring of basaltic boulders surrounding it, and there can be but little doubt as to this being the spot from which the lava in the immediate vicinity proceeded.

Wherever seen, from Portland to the foot of the Serra Range, the basalt is essentially the same rock, viz., a true dolerite, with olivine, triclinic felspar, and augite as its chief constituents.

The age of this rock is, I am aware, a moot point, some assigning it to the pliocene and others to the pleistocene period. I prefer to regard it as not older than pleistocene, for the following reasons :—

1. The lava flows from Mounts Napier and Eccles are even now most striking features of the landscape, looking like rivers of stone, as they wind along over miles of country, till they reach the sea coast, while the rocks still present such sharp angles that to attempt to walk over them would cut the stoutest boots to pieces in a few hours. Even supposing these to be of later date than the others mentioned, the difference of age cannot be great, tertiary fossils being alike found under all the basalt from Portland Bay to Muddy Creek.

2. The lava stream from Mount Eccles is, towards its termination, but little raised above sea level, and, as it is unmistakeably a subaërial flow, it must have been poured forth when the land stood at nearly its present height. Now, the gradual upheaval of the southern coast of Victoria in late geological times is proved by the presence of "raised beaches" of early pleistocene (or possibly late pliocene) age on the Glenelg at Limestone Creek, a description of which has been given by me,* and, as they were deposited when the land stood from 75 to 100 feet lower than now, it follows that the Mount Eccles overflow was a subsequent event, and could not therefore have taken place earlier than the pleistocene period.

3. The only deposit which can be identified as younger than the basalt is the dune limestone of Nelson Bay and neighbouring localities, and this, from its being still in course of formation, as well as from other evidence,† must be considered as recent. Immediately beneath it lies the basalt, which is, in all probability, the next older formation.

* Post Tertiary Strata of South-Western Victoria, Transactions Royal Society of Victoria, vol. xxiii. † *Ibid.*

Descriptions of some New Species of Marine Mollusca from South Australia and Victoria.

By Professor Ralph Tate, F.L.S., F.G.S.

[Read October 2nd, 1888.]

Plate XI.

Teredo fragilis, *spec. nov.* Plate xi., figs. 13*a*—13*c*.

Tube fragile, slender, simple, constricted at frequent intervals, but not septated internally; siphonal end incompletely divided lengthwise. The shell offers no distinctive character.

Animal with united siphons, furnished with two small shelly clavate pallets, the stalk much attenuated, the enlarged somewhat compressed upper portion crowned with a cartilaginous crust, which has a projecting horn at each end.

Dimensions.—Length, 65; diameter of circular aperture, 4·25 millimetres.

Locality.—Burrowing with the grain of the wood of the wharf-piles at Port Adelaide.

Coelodon patulus, *spec. nov.* Plate xi., fig. 1.

Shell thin, pellucid-white, compressed, inequilateral, inequivalve; right valve slightly convex, left valve flat in the dorsal region, concave ventrally. Anterior side short, subacutely rounded; posterior side prolonged, patulously extended ventrally, truncated. Post-dorsal line nearly straight, or slightly incurved, bounded by a slightly depressed linear-lanceolate area. Umbo depressed, rather acute, situated in the anterior one-fifth. Surface distinctly concentrically wrinkled.

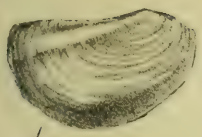
Dimensions.—Antero-posterior diameter, 16·5; dorso-ventral diameter, 9·5; sectional diameter of both valves, 1 millimetre.

Localities.—Dredged in life from 10 fathoms at Wool Bay, St. Vincent Gulf (McDougall and Matthews); dead shells dredged from deep water, Investigator Straits (South Australian Museum).

If *Pandora trilineata*, Reeve, from Ceylon, be a *Coelodon*, the present shell may have to be referred to it, as the only external differential characters are a slightly different shape (a straighter hinge line and a more acute posterior margin) and the absence of a nodulose dorsal rib.

Mactra Matthewsi, *spec. nov.* Plate xi., fig. 4.

Shell ovately trigonal, nearly equilateral, subtruncated behind, obtusely rounded in front. The post-dorsal margin is straight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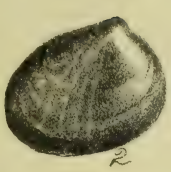
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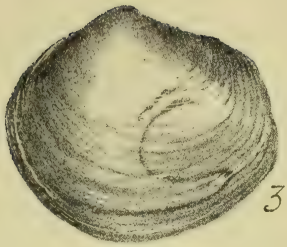
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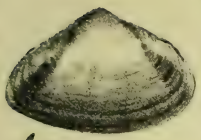
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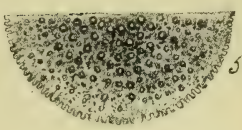
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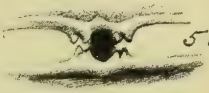
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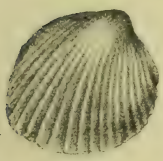
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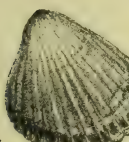
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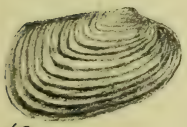
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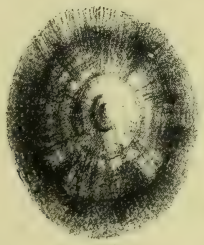
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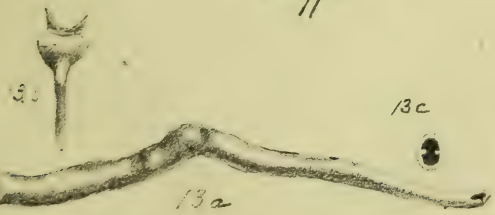
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and somewhat sloping, the antero-dorsal one is slightly incurved; the ventral margin is nearly straight, but slightly insinuate posteriorly. The umbo is small and acute.

The shell is thin, concentrically coarsely striated or folded; the colour is yellowish, whitish, or pink, usually varied with brown rays, those at each extremity are broader and more frequently present.

Dimensions.—Antero-posterior diameter, 18; umbo-ventral diameter, 11·5; sectional diameter of united valves, six millimetres.

Locality.—Common on the beach at Royston Head (*Matthews*).

This species must not be confounded with *M. Jacksoniensis*, from which is distinguished by its coarse ornament, less arched ventral margin, its blunt posterior margin, the less defined post-dorsal area and the equilaterality. From *M. pusilla*, A. Adams, it differs by not being acuminate at both ends.

Raeta meridionalis, *spec. nov.* Plate xi., fig. 3.

Shell whitish, very thin, translucent; ovately-suboblong, moderately convex antemedially, posteriorly gaping; umbo subacute, curved forward, situated in the anterior three-sevenths.

Anterior margin regularly rounded, ventral margin strongly arched; dorsal line sloping on both sides, more so in front than behind; posterior side narrowed and depressed, its margin somewhat squarely truncated and slightly reflected. There is an ill-defined depressed post-dorsal area, but no umbonal ridge.

Sinus widely rounded, horizontal, reaching to the centre, visible on the exterior.

Surface marked by fine lines of growth, which become more conspicuous and finely wavy wrinkled on the post-dorsal area,

Dimensions.—Antero-posterior diameter, 35; umbo-ventral diameter, 30; sectional diameter of left valve, eight millimetres.

Locality.—One valve collected by Mr. Magarey on the beach of Aldinga Bay.

Venerupis iridescens, *spec. nov.* Plate xi., fig. 10.

Shell rhomboidal, subdepressed; post-dorsal line straight; anterior side very short and narrow, slightly concave in front of the depressed acute umbo; posterior side long, expanded, squarely truncated at its margin, but rounded off post-ventrally; there is no defined umbonal ridge; ventral margin having a slight outward curve in its posterior half, thence rapidly ascending to the roundly attenuated front; umbo in about the anterior third.

Colour dirty white, iridescent, with a few spots of reddish brown. Ornament of concentric laminæ (about 15 conspicuous ones), and three or four concentric rounded threads in the inter-

spaces; the interstitial liræ and the umbonal aspect of the laminæ are crossed by fine, close striæ. The laminæ are erect, short, with an acute, slightly and irregularly broken edge.

Dimensions.—Antero-posterior diameter, 14·5; umbo-ventral diameter, 9·5; sectional diameter of united valves, 6 millimetres.

Locality.—One fresh specimen dredged in deep water off Kangaroo Island, Spencer Gulf (S. Aust. Mus.).

The only species having concentric striate ornament between the lamellæ, and without radial riblets are *V. tumida*, Sow., and *V. interstriata*, Sow.; the former shell is ventricose, and both are very finely striated between the lamellæ, whilst the present species is depressed, and the interstitial ornament consists of round threads, other less striking differences can be pointed ont.

Cardium erugatum, *spec. nov.* Plate xi., fig. 6.

Shell obliquely subquadrate, about as long as high; narrowed and rounded in front, broadish and curvedly truncate behind; inequilateral, moderately convex, pure white, and ornamented with about 25 flat ribs, much broader than the furrows. The medial ribs are wider than the anterior or posterior ones; the anterior ribs bear close, transverse, compressed scales.

Dimensions.—Antero-posterior diameter, 13; umbo-ventral diameter, 12·5; sectional diameter, 7 millimetres.

Locality.—A few single valves cast up at Royston Head, Southern Yorke Peninsula (G. F. Matthews).

This species seems to resemble *C. Dionæum*, Sowerby, but it has not the spinosely dentated ribs of that shell.

Carditella subradiata, *spec. nov.* Plate xi., fig. 7.

Shell minute, ovately trigonal, inequilateral, moderately convex; umbo large, antemedian; anterior side rounded, a little incurved in front of the umbo; ventrally rounded; posterior side a little produced, the post-dorsal slope nearly straight, inclined at an acute angle. Inner margin of valves distantly and deeply crenulated.

Surface smooth, shining, radially faintly ribbed, and concentrically coarsely striated. The ribs are about 15 in number, depressed, wider than the interspaces.

Dimensions.—Antero-posterior diameter, 3·5; umbo-ventral diameter, 3·5 millimetres.

Locality.—Shell sand, Royston Head.

This new species most resembles *C. radiata*, from the Eocene beds of the Adelaide district, but is inequilateral, and has an inflated umbo. It is more triangular than C. *infans* with fewer inornate ribs.

Kellia rostellata, *spec. nov.* Plate xi., fig. 14.

Shell minute, rather thin, semi-translucent, broadly heart-shaped, a little longer than high, inequilateral and moderately convex.

The dorsal margin is oblique on both sides, longer behind than in front, and excavated in front of the beaks. The ventral margin is rounded and curves upwards to the narrow and subrostrated anterior margin. The umbos are prominent, rather obtuse at the apex, approximate, not curved in front, and situated well in advance of the middle line.

The surface is finely and closely concentrically striated ; the colour is yellowish-horn, umbos and hinge-line brown with a vertical ray of the same colour increasing in breadth from the umbo to the ventral margin.

Dimensions.—Antero-posterior diameter, about 2·5 ; umbo-ventral diameter, 2 ; sectional diameter of united valves, 2 millimetres.

Locality.—Dredged in life, seven to nine fathoms, attached to seaweed, Port Phillip Heads, Victoria *(J. B. Wilson).*

This species has a general resemblance to *Lasæa rubra* ; but apart from the difference of dentition, it is distinguished by its subrostrated anterior side.

Montacuta semiradiata, *spec. nov.* Plate xl., fig. 2.

Shell minute, transversely ovate, moderately convex ; umbos antemedian, thick and rounded ; anterior and posterior margins rounded, ventral margin slightly curved outwards, posterior slope gently descending.

Surface smooth, shining, of a chocolate-brown colour, more or less translucent-white medially, with a few distant angular threads, appearing as pellucid rays, radiating from the umbo to the posterior half of the ventral margin.

Dimensions. — Antero-posterior diameter, 2 ; umbo-ventral diameter, 1·5.

Locality.—Parasitic on *Echinocardium*, east of Mud Island, Port Phillip, in seven to ten fathoms *(J. B. Wilson).*

Ephippodonta, *gen. nov.*

Name in allusion to the cardinal teeth riding as it were one on the other by their tips, and not interlocking.

Types.—Scintilla lunata, *Tate*, and Ephippodonta McDougalli, *spec. nov.*

Shell like *Galeomma*, flexible in life but brittle when dry, with two cardinal teeth in each valve, which are more or less bifid at their summits and opposed to each other and not alternating ; a large cartilage is wedged in between the teeth, and the dorsal margin is internally thickened.

The animal has the mantle lobes free all round to the dorsal line; in life the anterior margins of the lobes are largely expanded in a funnel form. The foot is somewhat disk shaped, very voluminous, and constitutes a broad locomotory surface.

This genus is separable from *Galeomma* and *Scintilla* by possessing two cardinal teeth in each valve, which are in apposition. The free mantle-lobes distinguish it further from *Galeomma*; the animal of *Scintilla* appears to be undescribed.

The animal of both species of *Ephippodonta* has the creeping habit of *Galeomma*, the valves are flexible and spread out flat when the animal is in motion; indeed, while in life the valves cannot be brought to a less angle of divergence than about 70 degrees.

Both species live on the mud-formed burrows of a shrimp, sheltering beneath large stones between tide-marks at Edithburg, Yorke Peninsula, South Australia.

Ephippodonta McDougalli, *spec. nov.* Plate xi., figs. 5*a*—5*b*.

Shell small, with each valve approximately semicircular in outline, subequilateral, flat, yellowish-white, dull.

Umbo inconspicuous. Surface of the valves with numerous compressed slender ridges, radiating from the umbo, about 21 principal ones regularly disposed with one or two smaller ones interposed, all bearing papillary scales; the margin of the valves with about 60 equal and equidistant square and deep crenatures.

Dimensions.—Length of dorsal line, 10; umbo-ventral diameter, 6 millimetres.

Locality.—Edithburg, St. Vincent Gulf *(McDougall)*.

This species differs from its congener by its inconspicuous umbo, by its conspicuous radial ribs, the indented free margin of the valves, and more regular outline.

Voluta Adcocki, *spec. nov.* Plate xi., fig. 8.

Shell oval-fusiform, spire moderately elongated terminated by a papillary pullus; whorls with a row of transversely elongate tubercles on the periphery (about 11 to a whorl). Aperture oval-elongate; outer lip thickened internally, but bevelled off to a thin edge, not reflected; columella with four oblique plaits increasing in size from the front backwards.

Colour yellowish-white with undulate, narrow, chestnut, transverse lines—the depth of the plication of the colour lines being intermediate between *V. Angasi*, Tate, and *V. undulata*, Lamarck; on the last whorl are two somewhat narrow chestnut spiral bands, one in front of the row of nodulations and in an alignment with the posterior angle of the aperture, the other about midway to the front on the dorsal aspect.

Dimensions.—Of the small example of 5 whorls—total length 41, of aperture 31 ; width of last whorl, 19 millimetres. Of the larger example—total length by estimate, 53 ; of aperture, 40 ; width of last whorl, 25 millimetres.

Locality.—One example, cast up at Middleton *(Mr Adcock)* ; the species previously known to Mr. Bednall by an example without locality in the South Australian Museum.

This species has the general aspect of *V. Pacifica*, *V. Kreuslerœ*, and *V. Thatcheri*, and, like them, has peripheral nodulations ; in the arrangement of the colour lines it combines the characteristics of *V. Bednalli*, A. Brazier, and *V. Angasi*, Tate. It is a much wider shell with a shorter spire than either *V. Kreuslerœ* or *V. Thatcheri*, and specially differs from *V. Pacifica* by its narrow aperture, not widening anteriorly as in that species.

Stylifer brunneus, *spec. nov.* Plate xi., fig. 9.

Shell subglobose : spire short, acuminately produced ; apex cylindrical, styliform : the other whorls are convex, of moderate increase, slightly depressed at the posterior suture ; sutures linear. Last whorl large, faintly angulated at the base and depressed at the suture, and in consequence having a perceptibly subquadrate outline.

Outer lip thin, regularly curved, acutely angled posteriorly ; columella thin, slightly elevated, defined by a superficial groove behind.

Colour dark brown, shining, black-brown around the suture, marked with microscopic crowded obliquely transverse lines and with distant spiral lines.

Animal with a large expanded disk-like mantle.

Dimensions.—Length, 5 ; breadth, 3·5 millimetres.

Locality.—Parasitic on *Strongylocentrotus*, invariably on the periproct, in eight to ten fathoms, Capel Sound, Port Phillip (*J. B. Wilson*).

This new species resembles in its squat shape *S. Turtoni*, *S. asterivola*, *S. ovoideus*, and *S. dubia;* but it has not the insinuated outer lip, obtusely-angled posteriorly, of those species. In its regular curved outer lip and general shape it agrees with *S. Stimpsoni*, Verrill, and *S. Orbignyanus*, Hupe ; but the more rapidly enlarging whorls and subquadrate last whorl distinguish it from them.

Umbrella corticalis, *spec. nov.* Plate xi., fig. 11.

Shell orbicular in outline, moderately elevated, with the apex prominent, somewhat incurved, and a little excentric ; covered, except apex, with a well developed epidermis, which extends about half as far again as the shell. The epidermis is raised into about 20 broad rays, diverging from the apex, and is concentri-

cally lamellose. It is pellucid white, but encircled with a band of maroon colour, corresponding with the edge of the shell; it is very tough, and can be readily removed in one piece.

The shell is of a primrose-yellow colour, thin, concentrically striated, and with a few obscure radial ridges.

The animal is of a deep port-wine colour ; the foot is circular in outline, with an extended margin; the underside of the mantle is covered with small white carunculæ.

Dimensions.—Transverse diameters, 19 and 15; height, 4 millimetres.

Localities.—Lower end of the South Channel of Port Phillip, seven to sixteen fathoms, sand and weed (*J. B. Wilson*). It has also been collected more than once in St. Vincent Gulf.

Lobiger Wilsoni, *spec. nov.* Plate xi., fig. 12.

Animal with the body produced into a very narrow, pointed, smooth tail of a green colour, shortly extended beyond the shell. Foot with two oblong-rounded and pale-green lobes, which are somewhat attenuated into a broadish stalk.

Shell thin, flexible, straw-yellow ; spire rudimentary but involute. Somewhat pyriform, slightly attenuated in front, and truncated apically ; aperture narrow-ovate, truncate behind. Surface finely striated. Length, 8 ; width, 5 millimetres.

Locality.—Lower end of South Channel of Port Phillip, seven to sixteen fathoms *(J. B. Wilson).*

EXPLANATION OF PLATE XI.

1. Cœlodon patulus, *Tate.* Enlarged.
2. Montacuta semiradiata, *Tate.* Much enlarged.
3. Raeta meriodionalis. *Tate.* Natural size.
4. Mactra Matthewsi, *Tate.* Slightly enlarged.
5. Ephippodonta McDougalli, *Tate. a,* Shell enlarged ; *b,* the valves laid opened to display cardinal teeth and cartilage, much enlarged.
6. Cardiaum erugatum, *Tate.* Slightly enlarged.
7. Carditella subradiata, *Tate.* Much enlarged.
8. Voluta Adcocki, *Tate.* Natural size.
9. Stylifer brunneus, *Tate.* Enlarged.
10. Venerupis iridescens, *Tate.* Slightly enlarged.
11. Umbrella corticalis, *Tate.* Natural size.
12. Lobiger Wilsoni, *Tate.* Enlarged.
13. Teredo fragilis, *Tate. a,* Tube, natural size ; *b,* a pallet much enlarged ; *c,* siphonal orifice of tube, enlarged.
14. Kellia rostellata, *Tate.* Much enlarged.

A Supplement to a List of the Lamellibranch and Palliobranch Mollusca of South Australia.

By Professor Ralph Tate, F.L.S., F.G.S.

[Read October 2nd, 1888.]

Such excellent results in conchological pursuits have been gained by some of my friends since the publication of my list of the South Australian bivalves two years ago, that to delay longer making known their discoveries would be undesirable, especially because some of the species are undoubtedly new to science.

The actual additions are 17 in number, and bring up the total to 187. Seven of them I consider to be diagnostically unknown. An uncertain species of Teredo has, through acquisition of complete material, been better defined, and a distinctive cognomen applied to it. The names of two of our fresh-water mussels were inadvertently misapplied. The corrections are herewith made, and a better specific determination is offered for a third, and a new one added.

To the list of species recorded for South Australia, but on insufficient data, should be added *Cardium donaciformis* reported as collected at Port Lincoln by Harvey; it is not improbable that *Donax cardioides* has been mistaken for it.

The sequence of the additional species in the classification, adopted in the original paper, is indicated by the numerals prefixed to the specific names.

Lamellibranchiata.

1. Teredo fragilis, Tate, *antea*, p. 60. Teredo sp. of Port Creek.

10*a*. Panopæa australis, Sowerby, Genera of Shells, No. 40, fig. 2. Ovate oblong, concentrically wrinkled, wider in front, obliquely truncated behind. Rapid Bay *(R. H. Pulleine);* Hardwicke Bay, Spencer Gulf *(G. F. Matthews);* also Victoria, Tasmania, New South Wales.

18*a*. Thracia modesta, Angas, Proc. Zool. Soc., 1867, t. 44, fig. 3, p. 908. Small, ovate, posterior side vertically truncate. Tapley Shoal *(Matthews* and *McDougall);* also New South Wales.

18*b*. Cœlodon patulus, Tate, *antea*, p. 60. Wool Bay, St. Vincent Gulf, in ten fathoms *(Matthews* and *McDougall);* Spencer Gulf, off Kangaroo Island *(S. Aust. Mus).*

22*a*. Mactra Matthewsi, Tate *antea*, p. 60. Royston Head *(Matthews)*.

28*a*. Raeta meridonalis, Tate, *antea*, p. 61. Aldinga Bay *(T. C. A, Magarey)*.

46*a*. Tellina modesta, Sowerby, Proc. Zool. Soc., 1883, t. 7, fig. 1, p. 31. A delicate white shining ovate shell with the posterior side slightly flexuous. Holdfast Bay *(D. J. Adcock)*; also New South Wales,

56*a*. Venerupis iridescens, Tate, *antea*, p. 61. Spencer Gulf *(S. Aust. Mus.)*.

76*a*. Cytherea disrupta, Sowerby, Thes. Conch., p. 117, t. 163, figs. 208, 209. Transversely ovate, somewhat acuminate behind, yellowish, blotched with purple-brown, in a more or less radiating manner. The South Australian examples are of small size—about three quarters of an inch—with surface concentrically sulcated rather than striated. Adult examples from New South Wales attain to two and three-quarter inches long. Spencer Gulf, off Kangaroo Island *(S. Aust. Mus.)*; also New South Wales and Tasmania.

86*a*. Cardium erugatum, Tate, *antea*, p. 62. South Yorke Peninsula *(Matthews)*.

98*a*. Sacchia Adamsi, Angas, as Mysia *(Felania)*, in Proc. Zool. Soc. 1867, t. 44, fig. 9, p. 910. Orbicular, depressed; hinge plate largely developed, grooved for reception of internal cartilage. Length and width about half an inch. Royston Head *(Matthews)*; also New South Wales.

111*a*. Ephippodonta McDougalli, Tate, *antea*, p. 64. Edithburgh, Yorke's Peninsula *(McDougall)*. *Scintilla lunata* also belongs to this new genus.

114*a*. Cardita Beddomei, E. A. Smith, in Voy. Challenger, t. 15, f. 5, p. 211. Sub-quadrate with about 30 ribs, bearing numerous small transverse nodules, spotted with orange on the medial and posterior areas; sulci rather narrower than the ribs. Length about five-eighths by half of an inch. Spencer Gulf, off Kangaroo Island *(S. Aust. Mus.)*; also Bass Straits.

114*b*. Cardita squamigera, Deshayes. Mag. Zool. 1853, p. 10. Reeve, Icon. Con., t. 4, f. 14. Broadly cordate, very wide and truncated behind; 20 narrow ribs, bearing sub-erect long scales becoming arched or tubular at the ventral margin. Length, three-eighths of an inch; width, quarter of an inch. Spencer Gulf, off Kangaroo Island *(S. Aust. Mus.)*. Locality unknown *(Reeve)*.

119*a*. Carditella subradiata, Tate, *antea*, p. 62. Royston Head, Yorke Peninsula *(Matthews)*.

121. Unio Angasi, Sowerby in Reeve's Icon. Conch., 1868, t. 55, f. 282. *U. Shuttleworthi*, Lea, is an older name, but is preoccupied by another Australian species described by Kuster.

122. Unio Evansi. *U. vittatus*, Lea, in Reeve's Icon. Conch., t, 83, seems to represent this species. Lagoons of the River Murray and Lake Alexandrina. Not in New South Wales.

123. Unio australis, Lamarck. Rivers Para and Onkaparinga.

123*a*. Unio ambiguus, Philippi. Scott's Creek, River Bremer, River Murray, Lake Alexandrina, and Mosquito Creek. By some authors this is referred to *U. australis*, but it differs by its shorter anterior side, less sloping anterior dorsal margin, and by the less ventricosity, especially in the umbo-post-ventral region.

151*a*. Pinna Tasmanica, Tenison Woods in Proc. Roy. Soc. Tasmania for 1875. Wedge-shaped, ribbed ; ribs towards the margin furnished with a few, irregularly placed, much raised tubular scales. Dead valves dredged in 11 to 15 fathoms off Tapley Shoal, St. Vincent Gulf *(Matthews* and *McDougall)*; also Victoria and Tasmania.

Class Palliobranchiata.

3*a*. Magasella Cumingi, Davidson 1852 ; *Reeve*, Conch. Icon., Terebratula, t. 7, f. 30. Smooth, ovate-oblong, ventral valve much deeper, with a produced and incurved beak. Length about one-third of an inch. Living examples dredged in 11 to 15 fathoms off Tapley Shoal *(Matthews* and *McDougall)*; dead shells from 27 fathoms off Encounter Bay ; also New South Wales and Tasmania.

A Census of the Molluscan Fauna of Australia.

By Professor Ralph Tate, F.L.S., F.G.S.

[Read October 2nd, 1888.]

My object is, in this essay, to present a comprehensive view of the constituents of the molluscan fauna of South Australia (omitting Polyzoa), and to indicate their exoteric relationships.

The accompanying tables are based upon a list of species showing their occurrences by political boundaries, which I have been compiling for the past ten years, partly as the result of bye-work in connection with the distribution of the genera in the Australian Tertiary deposits. This list cannot be without faults, but I think it makes a fair approach to accuracy both as to specific identities and distribution. I fear, however, that the number of species is in excess, as some of our Australian workers have relied too much on geographical isolation as an index to specific distinction; still, the duplication cannot be very serious as to affect the general conclusions at which I have arrived and submitted herein.

It is admitted that terrestrial provinces are not necessarily co-ordinate with marine ones, and it is the more desirable to review them independently, inasmuch as the terrestrial and fluviatile species of Australia are exclusively endemic, if we except a few species of *Melania* and *Neritina*.

The Marine Molluscan Fauna of Australia.

The marine fauna admits of grouping into two sections—one occupying the tropical shores, and largely consisting of migrants from the Oriental Marine Province; and the other belonging to the temperate waters, and largely consisting of endemic species and possessing several restricted genera. Where to draw lines of demarcation between the two regions is a difficulty, as no actual barriers to migration occur; on the east the transition is more pronounced than on the west coast, and I select the latitude of Maryborough, coinciding with the southerly termination of the Great Barrier Reef as a convenient point of separation. On the west coast a tropical fauna prevails as far south as Shark Bay, whilst at Freemantle the Australian species are in an ascendancy; no extensive lists of species have been published from any one locality north of King George's Sound, so that I

have no guide for delimitation. However, in my list all West Australian species from north of Swan River have been entered as belonging to the Indo-Australian Province.

The Australian province has yielded 1,672 species, of which 1,274, or 76 per cent., are restricted. Of the 399 extra-limital species, 57 are migrants to or from New Zealand, which is an outlier of the larger Australian province, whilst not a few others extend to the South Polynesian area, which has also received species from the Indo-Australian Province. Thirteen other components of this fauna link temperate Australia and South Africa. The only cosmopolitan species are *Saxicava arctica*, *Teredo nivalis*, *Lasæa rubra*, and *Ostrea edulis* (if *O. Angasi* be not distinct). Thus by these eliminations the actual number of Oriental species is reduced to 300, or about 18 per cent. of the whole.

The Indo-Australian Province has yielded 1,495 species, of which 676, or 45·2 per cent., are endemic in Australia, so that more than half the species are migrants from the Oriental Province.

The percentage of endemic species for the whole of Australia is 64, and for each class as follows:—Cephalopoda, 75·6; Gastropoda, 63·8; Scaphopoda, 28·5; Pteropoda, 0; Conchifera, 65·6; Palliobranchiata, 53.

The following table summarises the distribution of the marine species in each class or large group :—

Class.	Australian Province.		Indo-Australian Province.		Common to both Provinces.		Total Species in both Provinces	Total Endemic Species.
	Endemic.	Exotic.	Endemic.	Exotic.	Endemic.	Exotic.		
Cephalopoda	24	5	6	8	...	2	41	30
Gastropoda (Pectinibranchs)	786	237	356	528	50	108	1,749	1,092
" (Opisthobranchs)	89	23	33	33	4	8	166	118
Pulmonata	31	5	13	13	3	1	58	41
Scaphopoda	5	1	9	7	...	1	21	14
Pteropoda	...	13	...	...	...	...	13	...
Conchifera	332	109	256	227	42	50	832	546
Palliobranchiata ...	6	6	3	4	...	2	17	9
Totals	1,273	399	676	820	99	172	2,897	1,860
Totals	1,672		1,496		271		2,897	1,860

AUSTRALIAN GENERIC TYPES.

The following genera are peculiar :—

CEPHALOPODA.—*Tritaxeopus* (1 sp.).

GASTROPODA.—*Agnewia* (1 sp.); *Zemira* (1 sp.); *Pelicaria* (1 sp.), modified *Struthiolaria*, essentially New Zealandian; *Mesalia* (1 sp.); *Raulinia* (1 sp.), the only living representative of a Parisian Eocene type; *Ampullarina* (3 sp.); *Angasiella* (1 sp.); *Casella* (1 sp.); *Allportia* (1 sp.).

CONCHIFERA.—*Humphreyia* (3 sp.), *Myochama* (4 sp.), *Anapa* (2 sp.), *Ephippodonta* (2 sp.), *Mysella* (2 sp.), *Trigonia* (5 sp.).

PALLIOBRANCHIATA.—*Atretia* (1 sp.).

The following genera have their metropolis in the Australian Province :—

GASTROPODA.—*Cominella* chiefly confined to the temperate seas of the South Hemisphere; *Voluta*, Australia possesses half the number of known species, whilst the sections *Amoria* (10 sp.), *Volutoconus* (1 sp.), and *Mammilliaria* (1 sp.) are restricted; *Phasianella* is conspicuous by the large size attained by several of its species which are individually of common occurrence. *Thalotia*, *Cantharidus*, *Elenchus*, *Bankivia*, and *Crossea* are more largely represented specifically than in other Provinces.

CONCHIFERA.—*Myodora*, *Zenatia*, *Chamostrea*, *Carditella*, *Solenella*, and *Modiolarca* are chiefly confined to the cooler waters of the Southern Hemisphere, and the same observation is equally applicable to the following genera of Palliobranchiata :—*Kraussina* (2 sp.) and *Magasella* (1 sp.). Of less restricted genera of Conchifera, *Crassatella*, *Limopsis*, and *Anatina* are conspicuous by the number of their constituent species.

The Indo-Australian Fauna presents in its generic assemblage the characteristics of the widely-reaching Oriental Province, but some few typical Australian genera are represented, as the *Volutes*, *Trigonia*, *Myochama*, *Modiolarca*; whilst *Parastrophia* and *Watsonia*, among Gastropods, and *Austriella* and *Myrina*, among Conchifers, are peculiar; also North Australia furnishes the four known species of *Placuna*, two of which are endemic.

THE TERRESTRIAL AND FLUVIATILE MOLLUSCAN FAUNA OF AUSTRALIA.

The terrestrial mollusca are in their species very locally distributed, but the genera are nearly all widely dispersed over warm

and temperate regions. Of a total of 461 species, only two are extra-australian.

The tropical characteristics of the land snails of N.E. Queensland are indicated by the presence of the genera *Realia*, *Pupina*, *Callia*, *Cyclophorus*, *Diplommatina*, *Leptopoma*, *Helicina*, *Georissa*, *Tornatellina*, *Stenogyra*, *Stenopus*, *Vaginulus*, and the *geotrochoid Helices*; of these *Pupina*, *Helicina*, *Stenopus*, and the section *Geotrochus* of *Helix* extend in a few representatives into more southern latitudes.

The Australasian types (embracing S. Polynesia and New Zealand), which occur chiefly in our extratropical regions, are *Athoracophorus*, *Paryphanta*, *Rhytida* and *Diplomphalus*, and *Cystopelta*, which is peculiar.

The Fluviatile Mollusca are also with few exceptions endemic and of genera of world-wide distribution; it is only in *Melania* (1 sp.) and *Neritina* (5 sp.) that extra-australian species occur. Their esoteric distribution has not yet been fully worked out, and though some species are widely dispersed over the eastern half of the continent, yet the majority are so far only known to occur each in its own hydrographic area.

The genera *Amnicola* (if correctly identified) and *Gundlachia* are American; *Physopsis* in another species is South African; *Mycetopus* and *Larina* are tropical; whilst *Tatea* is peculiar.

Summary of the Terrestrial and Fluviatile Mollusca.

Class.	Extratropic.	Tropic.	Total.	Total Endemic.
Gastropoda ...	... 39	28	62	46
Pulmonata—				
Geophila (operculate) ...	5	37	40	38
Geophila (inoperculate)	261	175	421	421
Limnophila ...	... 69	26	93	93
Conchifera ...	... 26	28	42	41
Totals ...	380	293	658	649

Table showing Species in each Class.

	Endemic.	Exotic.	Total.
Cephalopoda	30	11	41
Gastropoda	1,256	721	1,977
Pulmonata	593	19	612
Scaphopoda	14	7	21
Pteropoda	—	13	13
Conchifera	588	286	874
Palliobranchiata ...	9	8	17
	2,490	1,065	3,555

Census of the Mollusca of Australia.

Table of Genera with Number of Species.

Class Cephalopoda.

Family Argonautidæ—		
Argonauta	...	2
Family Octopidæ—		
Tritaxeopus	...	1
Octopus	...	10
Family Teuthidæ—		
Loligo	...	2
Sepioteuthis	...	5
Family Sepiolini—		
Sepiola	...	1
Family Onychoteuthidæ—		
Onychoteuthis	...	1
Family Sepiadæ—		
Sepia	...	8
Sepioloidea	...	1
Family Cranchiadæ—		
Taonius	...	1
Family Spirulidæ—		
Spirula	...	1
Family Nautilidæ—		
Nautilus	...	3

Class Gastropoda.

order pectinibranchiata.

Family Muricidæ—		
Murex	...	32
Typhis	...	5
Trophon	...	9
Purpura	...	10
Cuma	...	2
Ricinula	...	9
Rapana	...	1
Coralliophila	...	4
Agnewia	...	1
Family Tritonidæ—		
Triton	...	27
Distorsio	...	1
Epidromus	...	4
Ranella	...	15
Family Fusidæ—		
Fusus	...	14
Fasciolaria	...	3
Peristernia	...	7
Latirus	...	3
Family Fusidæ—		
Leucozonia	...	1
Melongena	...	3
Hemifusus	...	2
Siphonalia	...	6
Tudicula	...	3
Pisania	...	4
Cantharus	...	8
Cominella	...	9
Zemira	...	1
Phos	...	6
Nassaria	...	4
Cyllene	...	1
Family Nassidæ—		
Truncaria	...	1
Nassa	...	38
Neritula	...	1
Family Volutidæ—		
Melo	...	3
Voluta	...	37
Lyria	...	2
Mitra	...	74
Family Marginellidæ—		
Erato	...	7
Marginella	...	43
Family Olividæ—		
Olivella	...	6
Oliva	...	13
Harpa	...	2
Ancillaria	...	8
Family Collumbellidæ—		
Columbella	...	51
Engina	...	5
Terebra	...	45
Euryta	...	2
Family Conidæ—		
Conus	...	41
Family Pleurotomidæ—		
Pleurotoma	...	13
Drillia	...	24
Bela	...	2
Clavatula	...	1
Surcula	...	6
Mangilia	...	38
Clathurella	...	28

Family Pleurotomidæ—		
Daphnella	...	13
Raphitoma	...	5
Family Cancellaridæ—		
Cancellaria	...	12
Trichotropis	...	2
Family Strombidæ—		
Strombus	...	17
Terebellum	...	1
Pteroceras	...	3
Pelicaria	...	1
Family Cypræidæ—		
Cypræa	...	59
Trivia	...	9
Ovula	...	8
Neosimmia	...	1
Volva	...	3
Family Doliidæ—		
Dolium	...	4
Pyrula	...	2
Family Cassidæ—		
Cassis	...	4
Semicassis	...	11
Oniscia	...	2
Family Naticidæ—		
Natica	...	15
Neverita	...	28
Amaura	...	2
Sigaretus	...	3
Naticina	...	4
Narica	...	5
Family Marseniadæ—		
Marsenia	...	2
Family Calyptræidæ—		
Calyptræa	...	1
Sigapatella	...	1
Crepidula	...	4
Capulus	...	1
Amathina	...	1
Hipponyx	...	4
Mitrularia	...	1
Family Xenophoridæ—		
Xenophora	...	3
Family Vermitidæ—		
Vermetus	...	3
Bivonia	...	2
Thylacodes	...	7
Siliquaria	...	5
Family Turritellidæ—		
Turritella	...	17
Torcula	...	4
Mesalia	...	1
Family Scalariidæ—		
Scalaria	...	25
Cirsotrema	...	5
Crossea	...	5
Family Solariidæ—		
Solarium	...	10
Philippia	...	2
Family Pyramidellidæ—		
Pyramidella	...	20
Odostomia	...	20
Actæopyramis	...	3
Turbonilla	...	17
Eulimella	...	8
Mathilda	...	5
Aclis	...	4
Eulima	...	28
Mucronalia	...	2
Stylifer	...	8
Family Cerithiopsidæ—		
Cerithiopsis	...	7
Family Cerithiacea—		
Cerithium	...	27
Vertagus	...	13
Potamides	...	
Lampania	...	4
Tympanotonos	...	2
Terebralia	...	2
Telescopium	...	1
Pyrazus	...	1
Bittium	...	15
Cerithidea	...	4
Triforis	...	14
Diala	...	13
Styliferina	...	3
Planaxis	...	3
Quoyia	...	1
Litiopa	...	1
Family Littorinidæ—		
Littorina	...	8
Tectaria	...	7
Risella	...	3
Modulus	...	1
Raulinia	...	1
Fossarus	...	3
Fossarina	...	4
Family Heterophrosynidæ—		
Barleeia	...	1
Family Rissoidæ—		
Rissoa	...	39
Rissoina	...	35
Scaliola	...	3
Hydrobia	...	6
Amnicola	...	5

Family Rissoidæ—		
Bithynella	...	2
Paludinella	...	1
Tatea	...	1
Bithynia	...	9
Assiminea	...	3
Family Paludiniidæ—		
Paludina	...	9
Larina	...	1
Family Valvatidæ—		
Valvata	...	1
Family Melaniidæ—		
Melania	...	17
Family Cæciidæ—		
Parastrophia	...	1
Watsonia	...	1
Cœcum	...	7

ORDER SCUTIBRANCHIATA.

Family Neritidæ—		
Nerita	...	10
Navicella	...	1
Neritina	...	9
Family Liotiidæ—		
Liotia	...	16
Adeorbis	...	3
Cyclostrema	...	15
Cirsonella	...	1
Delphinula	...	2
Family Rotelliidæ—		
Ethalia	...	3
Family Turbinidæ—		
Phasianella	...	7
Turbo	...	20
Collonia	...	1
Calcar	...	5
Family Trochiidæ—		
Trochus	...	11
Zizyphinus	...	20
Turcica	...	1
Thalotia	...	12
Cantharidus	...	11
Elenchus	...	11
Gibbula	...	15
Solariella	...	9
Monodonta	...	2
Polydonta	...	4
Clanculus	...	21
Monilea	...	4
Euchelus	...	6
Trochocochlea	...	4
Bankivia	...	1
Leiopyrga	...	2
Family Trochiidæ—		
Astele	...	1
Diloma	...	2
Family Haliotiidæ—		
Stomatella	...	8
Stomatia	...	2
Gena	...	4
Haliotis	...	22
Tæinotis	...	3
Family Pleurotomariidæ—		
Schismope	...	5
Scissurella	...	1
Basilissa	...	1
Minos	...	1
Family Fissurellidæ—		
Fissurella	...	12
Macrochisma	...	3
Fissurellidæa	...	3
Emarginula	...	11
Tugalia	...	4
Scutus	...	2
Puncturella	...	2
Rimula	...	1
Zeidora	...	1
Family Patellidæ—		
Patella	...	18
Nacella	...	1
Family Acmæidæ—		
Acmæa	...	10
Scutellina	...	2
Family Ianthinidæ—		
Ianthina	...	3
Recluzia	...	1

ORDER POLYPLACOPHORA.

Microplax	...	1
Angasia	...	1
Callochiton	...	1
Ischnochiton	...	8
Callistochiton	...	2
Chaetopleura	...	2
Tonicia	...	3
Chiton	...	13
Acanthopleura	...	4
Stenochiton	...	1
Lorica	...	3
Schizochiton	...	1
Plaxiphora	...	4
Acanthochiton	...	4
Notoplax	...	1
Onithochiton	...	2
Cryptoplax	...	6

ORDER TECTIBRANCHIATA.

Family Tornatellidæ—
- Actæon ... 3
- Buccinulus ... 10
- Ringicula ... 9

Family Bullidae—
- Bulla ... 8
- Haminea ... 8
- Atys ... 14
- Akera ... 3
- Cylichna ... 13
- Volvula ... 2
- Diaphana ... 2
- Tornatina ... 13
- Utriculus ... 2
- Myonia ... 2
- Scaphander ... 1
- Aplustrum ... 1
- Hydatina ... 3

Family Lophocercidæ—
- Lophocercus ... 1
- Lobiger ... 1
- Cylindrobulla ... 1

Family Philinidæ—
- Philine ... 2
- Chelidonura ... 1

Family Aplysiidæ—
- Aplysia ... 9
- Dolabrifera ... 1
- Dolabella ... 2

Family Pleurobranchiadæ—
- Pleurobranchus ... 1
- Pleurobranchidium 1
- Umbrella ... 2

ORDER NUDIBRANCHIATA.

Family Doridídæ—
- Doris ... 13
- Angasiella ... 1
- Casella ... 1
- Chromodoris ... 6
- Gonidoris ... 1
- Polycera ... 1
- Plocamophorus ... 2
- Triopia ... 1
- Ceratosoma ... 2

Family Doridopsidæ—
- Doridopsis ... 5

Family Tritoniadæ—
- Bornella ... 1
- Melibæa ... 1

Family Æolidæ—
- Æolis ... 2
- Flabellina ... 3
- Janus ... 1
- Glaucus ... 1

Family Elysiidæ—
- Elysia ... 2
- Allportia ... 1

Family Phyllirhoidæ—
- Phyllirhoe ... 1

CLASS SCAPHOPODA.
- Dentalium ... 11
- Entalis ... 5
- Siphodentalium ... 2
- Cadulus ... 3

CLASS PTEROPODA.
- Hyalea ... 8
- Styliola ... 1
- Cuvieria ... 1
- Cymbula ... 1
- Tiedemannia ... 1
- Spiralis ... 1

CLASS PULMONATA.

Family Auriculidæ—
- Auricula ... 3
- Alexia ... 1
- Pythia ... 1
- Marinula ... 1
- Melampus ... 12
- Cassidula ... 6
- Plecotrema ... 6

Family Amphibolidæ—
- Ampullarina ... 3

Family Siphonariidæ—
- Siphonaria ... 10
- Gadinia ... 2

Family Onchidiidæ—
- Onchidium ... 4

Family Truncatellidæ—
- Truncatella ... 7
- Blandfordia ... 2

Family Cyclostomidæ—
- Realia ... 1
- Pupina ... 17
- Callia ... 1
- Diplommatina ... 3
- Cyclophorus ... 4
- Leptopoma ... 1
- Helicina ... 12
- Georissa ... 1

Family Arionidæ—		
Cystopelta	...	1
Family Limacidæ—		
Limax	...	2
Amalia	...	2
Family Vitrinidæ—		
Helicarion	...	18
Parmacochlea	...	1
Family Helicoidea—		
Rhytida	...	19
Diplomphalus	...	4
Paryphanta	...	4
Family Zonitidæ—		
Nanina	...	14
Zonites	...	36
Stenopus	...	3
Family Succineidæ—		
Succinea	...	11
Athoracophorus	...	1
Family Vaginulidæ—		
Vaginulus	...	1
Family Helicidæ—		
Cœliaxis	...	1
Vertigo	...	10
Tornatellina	...	6
Stenogyra	...	1
Bulimus	...	24
Helix	...	261
Family Limnædæ--		
Limnæa	...	13
Amphipeplea	...	1
Bulinus	...	60
Physopsis	...	1
Ancylus	...	4
Gundlachia	...	1
Planorbis	...	11
Segmentina	...	2

Class Lamellibranchiata.

Family Gastrochænidæ—		
Aspergillum	...	3
Humphreyia	...	3
Clavagella	...	2
Gastrochæna	...	3
Family Teredinidæ—		
Teredo	...	4
Family Pholadidæ—		
Barnea	...	2
Jouannetia	...	1
Parapholas	...	2
Martesia	...	1
Family Solenidæ—		
Solen	...	7
Family Solenidæ—		
Cultellus	...	1
Solecurtus	...	4
Family Saxicavidæ—		
Saxicava	...	1
Panopæa	...	1
Family Myacidæ—		
Mya	...	1
Corbula	...	10
Cryptomya	...	1
Poromya	...	2
Neæra	...	7
Family Anatinidæ--		
Cœlodon	...	2
Myodora	...	10
Myochama	...	4
Thracia	...	9
Lyonsia	...	1
Anatina	...	16
Family Mactridæ—		
Mactra	...	29
Rangia	...	1
Lutraria	...	4
Zenatia	...	1
Ræta	...	1
Eastonia	...	1
Moldia	...	1
Family Paphidæ—		
Paphia	...	13
Anapa	...	2
Ervilia	...	1
Family Semelidæ—		
Semele	...	13
Syndosmya	...	2
Cumingia	...	1
Family Tellinidæ—		
Asaphis	...	1
Psammobia	...	14
Sanguinolaria	...	1
Hiatula	...	7
Tellina	...	49
Metis	...	1
Macoma	...	13
Arcopagia	...	7
Phyllodia	...	1
Gastrana	...	1
Donax	...	13
Family Petricolidæ—		
Petricola	...	1
Naranio	...	2
Venerupis	...	14
Saxidomus	...	1

Family Veneridæ—		
Venus	...	8
Chione	...	29
Cytherea	...	19
Circe	...	15
Meroe	...	6
Dosinia	...	22
Clementina	...	2
Tapes	...	18
Family Glaucomyidæ—		
Glaucomya	...	2
Family Cycladidæ—		
Sphærium	...	6
Pisidium	...	4
Corbicula	...	11
Cyrena	...	11
Family Isocardiidæ—		
Cypricardia	...	1
Trapesium	...	1
Coralliophaga	...	1
Family Cardiidæ—		
Cardium	...	21
Family Verticordiidæ—		
Verticordia	...	2
Family Chamidæ—		
Chama	...	12
Chamostrea	...	1
Family Tridacnidæ—		
Hippopus	...	1
Tridacna	...	4
Family Lucinidæ—		
Lucina	...	22
Loripes	...	4
Austriella	...	1
Cryptodon	...	2
Corbis	...	2
Family Ungulinidæ—		
Diplodonta	...	10
Sacchia	...	2
Family Erycinidæ—		
Montacuta	...	4
Lasæa	...	1
Lepton	...	4
Pythina	...	3
Galeomma	...	2
Scintilla	...	9
Ephippodonta	...	2
Mysella	...	2
Kellia	...	8
Family Solemyidæ—		
Solemya	...	1
Family Astartidæ—		
Crassatella	...	15
Family Astartidæ—		
Cardita	...	16
Carditella	...	4
Mytilicardia	...	11
Thecalia	...	1
Family Unionidæ—		
Mycetopus	...	1
Unio	...	20
Family Trigoniidæ—		
Trigonia	...	5
Family Nuculidæ—		
Nucula	...	11
Leda	...	15
Solenella	...	1
Family Arcidæ—		
Arca	...	5
Barbatia	...	17
Scapharca	...	2
Trisis	...	2
Pectunculus	...	12
Limopsis	...	8
Family Mytilidæ—		
Mytilus	...	12
Modiola	...	10
Lithodomus	...	9
Modiolaria	...	7
Myrina	...	1
Septifer	...	1
Modiolarca	...	2
Family Aviculidæ—		
Avicula	...	5
Meleagrina	...	4
Perna	...	4
Crenatula	...	4
Vulsella	...	3
Malleus	...	4
Family Pinnidæ—		
Pinna	...	
Family Spondylidæ—		
Spondylus	...	11
Plicatula	...	3
Family Limidæ—		
Lima	...	7
Limea	...	1
Family Pectinidæ—		
Pecten	...	33
Amusium	...	5
Family Anomiidæ—		
Anomia	...	1
Placunanomia	...	2
Family Placuniidæ—		
Placuna	...	4

Family Ostreidæ—		
Ostrea	...	11
Class Palliobranchiata.		
Family Terebratulidæ—		
Terebratula	...	1
Waldheimia	...	1
Terebratulina	...	1
Magasella	...	1
Megerlia	...	2
Family Terebratulidæ—		
Kraussina	...	2
Family Rhynchonellidæ—		
Atretia	...	1
Family Craniidæ—		
Crania	...	1
Family Discinidæ—		
Orbicula	...	1
Family Lingulidæ—		
Lingula	...	6

Additions to the Flora of the Port Lincoln District, including brief Descriptions of Two New Species.

By Professor Ralph Tate, F.L.S., F.G.S.

[Read October 2, 1888.]

A hurried excursion, occupying a few days in the early part of November, 1887, in the Port Lincoln district, brought to my knowledge the occurrence of 51 species not hitherto known there. The country traversed is well within the wettest part, and is therefore the most typical portion of the phytographic district of Southern Eyre Peninsula. The route was from Port Lincoln by way of Little Swamp, the Fountain, to Lake Wangary, to Marble Range, to Kellidie Bay (an extension of Coffin Bay), to Strawberry and Winter's Hills on the west slope of the coast range, which extends north from Port Lincoln, and back to the seaport. The leading physical features are—

1. The coast range, consisting of metamorphic rocks, is clothed with open forests of Casuarina, and Eucalypts according to the nature of the soil.

2. A low depressed area, to the west, extends to the coast line on the south-west, and is interrupted on the north-west by isolated peaks of metamorphic rocks, as Marble Range (a misnomer, as the rock is a hard highly metamorphic quartzite), North Block, &c. Towards the sea-coast much of this depressed country is occupied by swamps, whilst the relatively high ground, or rises, constitutes heath lands, or grass lands interspersed with thickets and light timber, particularly of *Eucalyptus corynocalyx*.

Ranunculus aquatilis. Swamps at Little Swamp and near Kellidie Bay.

Ranunculus lappaceus. Thickets near Fountain.

Drosera pygmæa. Wet heath near Little Swamp.

Comesperma calymega. Wet heath near Little Swamp.

Commerçonia Tatei, *F. v. Mueller*. Heath ground near Fountain. This new species is a low diffuse under-shrub, with the branches extending to one foot or more, with "remarkably reduced cyme, only one or two flowers as a rule being developed."

Thomasia petalocalyx. Heath ground, Fountain.

Claytonia calyptrata. Marble Range.

Rumex Brownii, Bushy places near Fountain; Marble Range.

Haloragis tetragyna. Heathy ground, rather general.
Myriophyllum verrucosum. Swamps, common.
Myriophyllum Muelleri. Swamps, common.
Grevillea lavandulacea. Marble Range.
Hydrocotyle hirta. Coomonoga, near Little Swamp.
Lagenophora Billardieri. Kellidie Bay; Winter's Hill; Marble Range.
Brachycome Muelleri. Bushy places near Fountain.
Brachycome cuneifolia, *Tate*. Bushy places near Fountain. A tufted glabrous annual; leaves radical, thin, narrow-cuneate or spathulate, coarsely and deeply obtusely toothed, attenuated into a narrow petiole, mostly one to one and a half inches. Scapes several, one flowered, about three inches long, with a linear-lanceolate bract towards the base. Heads about one quarter inch in diameter; ray-flowers conspicuous, blue, very narrow, in a single row; scarious margin of involucral bracts, blue; achenes flat, with an entire membranous wing; pappus minute. In the habit this new species recalls *B. decipiens*, from which it is readily distinguished by its winged fruits.
Cotula filifolia. Freshwater swamps, Little Swamp, Fountain, &c.
Cotula cornopifolia. Freshwater swamps, Little Swamp, Fountain, &c.
Cotula australis. Bushy places, Coomonoga, &c.
Leptorrhynchos squamatus. Marble Range.
Stuartina Muelleri. Wet heath ground, Coomonoga.
Erechthites hispidula. Swamp at Fountain.
Podotheca angustifolia. Sandy ground, Lake Wangary to Coffin Bay.
Limnanthemum exaltatum. Swamps at Coomonoga
Limosella aquatica. Lake Wangary.
Wilsonia rotundifolia. Kellidie Bay.
Dichondra repens. Marble Range.
Cynoglossum australe. Kellidie Bay.
Dichopogon laxum. Winter's Hill; Fountain.
Triglochin striata. Fountain; Lake Wangary.
Potamogeton natans. Swamps about Little Swamp, and between Fountain and Kellidie Bay.
Potamogeton pectinatus. Swamps about Little Swamp, and between Fountain and Kellidie Bay.
Lepilæna Preissi. Swamps about Little Swamp, and between Fountain and Kellidie Bay.
Typha angustifolia. Pools on the River Todd.
Xanthorrhœa semiplana. Very widely diffused.
Xanthorrhœa Tateana. Marble Range.

Juncus bufonius. Little Swamp.
Juncus pallidus. Marble Range, and towards Kellidie Bay.
Cladium schœnoides. Wet heath, Coomonoga.
Cladium filum. In all the swamps, especially near the sea.
Heleocharis acuta. Little Swamp.
Isolepis cartilagineus. Swamp at Fountain.
Schœnus apogon. Swamp at Fountain.
Stipa semibarbata. Winter's Hill, and other grassy places on the Coast Range.
Stipa aristiglumis. Winter's Hill, and other grassy places on the Coast Range.
Stipa teretifolia. Rocks by the sea, Kellidie Bay.
Agrostis Solandri. Heath ground at Fountain.
Danthonia penicillata. Winter's Hill.
Festuca littoralis. Kellidie Bay, and towards Lake Wangary.
Lepturus incurvatus. Swampy ground at Coomonoga.
Asplenium flabellifolium. Marble Range.

The following additions have been determined from gatherings made by Mrs. Richards at Fowler Bay:—Ranunculus parviflorus, Epaltes Tatei, Gnaphalium indutum, Pterostylis mutica; and at Denial Bay, Orobanche Australiana.

Plants of the Lake Eyre Basin.

By Professor Ralph Tate, F.L.S., F.G.S., &c.

In my address delivered before the Biological Section of the Australasian Association for the Advancement of Science at its meeting in August, I occupied myself with the large question of the influence of climatological and geological changes on the distribution of the constituents of the Australian Flora. In it I gave summaries of facts rather than details, and among others those relating to the plants of the Lake Eyre Basin. This flora will have some special interest for us, and I venture to submit to you those particulars of it which are wanting in my address.

The flora of the Lake Eyre Basin was selected as best illustrating the characteristics of the botanical region which I had named Eremian; geographically it is only a small section of the region. Lake Eyre is situated nearly in the centre of the continent, and at or a little below sea level. It occupies the centre of the area of normally high barometric pressure, and minimum rainfall in Australia. The annual rainfall on the south and west does not exceed five inches, though it is a little more on the east; but the whole area is subjected to protracted droughts. The area has passed through extreme climatic vicissitudes, and it offers the very best initial study on the nature and origin of the Eremian flora as a whole.

The basin is vast, but I restrict myself in this communication to the depressed area around the lake—an area that probably coincides with the former extension of the lacustrine waters (now salt to saturation). The bounding more elevated lands on the south, and the Peake ranges on its north-west, and hence to the MacDonnell Range yield, as far as botanically known, the same type of flora, though richer in genera and to some extent specifically distinct. The floral type, which prevails, extends all over the central region of the continent, from the west of the Cordilleras of Eastern Australia to the western seaboard between the Gascoyne and De Grey rivers.

Phytographically, this region isolates the *Autochthonian* (S.W. Australia) from the *Euronotian* (S.E. Australia), the dry intervening country presenting an effectual barrier to an interchange of species. If, as I suppose, that the Lake Eyre basin, which is now a sandy-saline waste, was once occupied by a vast inland sea of fresh water, of which Lakes Blanche and Frome are outliers, whilst contemporaneously Lake Torrens and the system of

lakes about Lake Gardner were conjoined, such extension of the inland waters must have largely operated in checking migration from west to east or *vicé versâ*. The only way of intercourse then would have been in more northern latitudes which are beyond the latitudinal distribution of the related species in the two extreme regions. It seems probable that the isolation of the *Autochthonian* flora antedates the period of deposition of the Cretaceous rocks, which occupy so vast an area in Central Australia, and that the Eremian flora was introduced in comparatively recent times.

In the volumes of the Flora Australiensis are recorded many species from the Lake Eyre basin, chiefly based on the collections made by Babbage, Burke and Wills expedition, the Victorian expedition (in search of Burke and Wills), and by Lewis. In most cases topographic definition has not been given, and wherever possible they have been replaced by me in the accompanying list by exact localities.

The collections of plants upon which the bulk of the species is based I owe to the following gentlemen :—

To Mr. J. C. Chandler a small collection gathered in the neighbourhood of Peake and received in 1882.

To Mr. James McLeod for a large collection made at Innaminka, the site of Burke's grave, eleven miles west of the Queensland boundary, received August, 1884; a second collection by the same made in the autumn of the following year along the stock road from Innaminka by the Strzelecki to Lake Frome.

To Mr. Malcolm Murray for a choice collection gathered by him early in 1885 on the south and west sides of Lake Eyre, between Callana and Anna Creek.

To Mr. E. G. Millard for many species collected by him in the spring of 1886 at Kalamurina Station, on the Warburton River (or Lower Diamantina), 30 miles south-east of Cowarie.

I have also examined a collection made by Dr. Cleland in 1886 on a journey from Hergott to Strangways; and also one collected at Tingatingana Station, on the Strzelecki Creek, about midway between Innaminka and Lake Frome.

Lastly, I visited the country about Callana during the winter of the present year.

The sign [!] which is affixed to localities indicates that I have examined authentic specimens, and that the specific determinations are mine.

The list contains the names of 388 species, less than half of the known species in the extratropical part of the South Australian portion of the Eremian region; but it is almost certain that some common plants are not included, and a very slight extension of the assumed southern boundary would largely add to

it. The sequence of the orders and the specific names are according to Baron Mueller's Census of the Australian Flora.

In the margin I have indicated the distribution of the extra-australasian species, the abbreviations employed being as follows:—o, Oriental; e, Ethiopian; t, Tropics; a, Andean; med, Mediterranean; cos, Cosmopolitan, or nearly so. The species of exotic origin number 68, which is equivalent to 17 per cent. of the whole; whilst for the whole continent the percentage is twelve, the figures being as follows:—

Immigrant species	1,058	1,236
Emigrant species	178	
Total species	8,800	

The asterisk prefixed to the species-name indicates that the species is essentially Eremian, and the double asterisk that it is peculiarly Eremian.

List of localities:—

South side of Lake Eyre.—Farina, Hergott, Callana, Stuart's Creek, Priscilla Springs; all on the Great Northern Line of Railway.

West side.—Beresford, Strangways and William Springs (tableland adjoining), Anna Creek, and Peake; all on the Great Northern Line of Railway. The Margaret approaches the Railway in the vicinity of Coward Springs.

Cootanoorrinna is about 30 miles south-west from Peake, and Nilpinna is about half-way. The Neales intersects the Telegraph Line 13 miles north of Peake.

North-east side.—Warburton River.

East side.—Innaminka, on Cooper Creek, near here the floodwaters of Cooper Creek discharge into the Strzelecki.

South-east side.—Hamilton Creek, John Creek, Paralana, and Wooltana, on the north-west side of Lake Frome.

List of Species, with Localities, &c.

order cruciferæ.

* Sisymbrium trisectum. Cooper Creek *(Fl. Aust.)*; Strangways!

cardaminoides. Strzelecki Creek!; Warburton River!; Innaminka!

* Erysimum lasiocarpum. John Creek!; Strzelecki Creek!; Warburton River!

* brevipes. John Creek; Lake Frome!; Strzelecki Creek!

** Erysimum Blennodia. Innaminka!; Warburton River!; Strzelecki Creek!
** Stenopetalum velutinum. Between Stoke's Range and Cooper Creek *(Fl. Aust.)*.
** nutans. The same.
** croceum. Innaminka!
** Lepidium phlebopetalum. Strangways to Hergott!; Peake!
* monoplocoides. Warburton River!
* papillosum. Between Stokes' Range and Cooper Creek *(Fl. Aust.)*.

ORDER CAPPARIDEÆ.

** Capparis Mitchelli. Cooper Creek *(F. v. M.)*.

ORDER PITTOSPOREÆ.

Pittosporum phillyroides. South of Callana!

ORDER DROSERACEÆ.

Drosera Menziesi. John Creek, Lake Frome!

ORDER MALVACEÆ.

Lavatera plebeia. Strzelecki Creek; Hergott to Strangways!
T. Malvastrum spicatum. Strzelecki Creek!; Hergott to Strangways!; Cootanoorrinna!
Sida corrugata. Warburton River! Innaminka!
** virgata. Hergott to Strangways!
* petrophila. Between Stokes' Range and Cooper Creek *(Fl. Aust.)*. John Creek!
** intricata. Peake!
* calychymenia. The Margaret *(Fl. Aust.)*.
** inclusa. Near Lake Eyre *(Fl. Aust.)*.
** Abutilon halophilum. Innaminka!; Peake!
** diplotrichum. Between Lake Eyre and River Finke *(C. Giles)*.
** leucopetalum. Cooper Creek *(Howitt)*.
** otocarpum. Lake Eyre *(F. v. M.)*.
oxycarpum. Near Lake Eyre *(E. Giles)*.
** Fraseri. Warburton River!; Peake!
O.E. Avicennæ. Cooper Creek *(Wright)*.
O.E. Hibiscus trinum. Cooper Creek.
* Krichauffianus. Cooper Creek *(Victorian Exp.)*.
Sturtii. Wooltana, Lake Frome!
** Gossypium Sturtii. Wooltana!; north-east side of Lake Eyre *(Sturt)*.
* Plagianthus glomeratus. Near Lake Eyre *(C. Giles)*.

ORDDR EUPHORBIACEÆ.

* Euphorbia Drummondi. Warburton River!; Innaminka!; Strzelecki Creek.
** erythrantha. Peake!
** Wheeleri. Between Stoke's Range and Cooper Creek *(Wheeler)*; Innaminka!
* eremophila. Between Hergott and Strangsways!; Innaminka!
** Phyllanthus Fuernrohrii. Between Lake Eyre and River Finke *(E. Giles)*.
** lacunarius. The Hamilton! Lake Frome; Warburton River!

ORDER UTICACEÆ.

T.A. Parietaria debilis. Paralana, Lake Frome!

ORDER SAPINDACEÆ.

T. Dodonæa viscosa. Strzelecki Creek!
** microzyga. Neale's River *(Stuart Exp.)*; Strzelecki Creek!
Heterodendron oleifolium. Cooper Creek *(Fl. Austral.)*.
Atalaya hemiglauca. Strzelecki Creek!

ORDER HYPERICINEÆ.

O. Hypericum Japonicum. Strzelecki Creek!

ORDER ELATINEÆ.

O.E. Bergia ammannioides. Innaminka!

ORDER GERANIACEÆ.

Erodium cygnorum. Innaminka!; Peake!

ORDER ZYGOPHYLLEÆ.

O. Tribulus terrestris. Peake!; between Hergott and Strangways!
** hystrix. Between Hergott and Strangways!; Innaminka!
Zygophyllum glaucescens. Strzelecki Creek!
** iodocarpum. Cootanoorrinna, and generally diffused on west side of Lake Eyre!
Billardieri. Innaminka!; between Hergott and Strangways!
fruticulosum. Innamika!
ammophilum. Warburton River!; Innaminka!
** Howitti. Warburton River!
MED. Nitraria Schoeberi. Warburton River!

ORDER FRANKENIACEÆ.

MED. Frankenia laevis. Very general!

ORDER CARYOPHYLLEÆ.

Polycarpæa synandra. Sandy flats of Anna Creek!; Wirrawirraloo *(Babbage)*.

O. E Indica. Strzelecki Creek!

ORDER PORTULACEÆ.

Portulaca oleracea var grandiflora. Sandhills at Nilpinna! (*vulgo* 'muneroo').

** Claytonia Balonnensis. Innaminka!; Strzelecki Creek!; Warburton River!; Peake!

** pleiopetala. Wills Creek *(Howitt)*.

** ptychosperma. Between Lake Eyre and River Finke *(F. & M.)*

ORDER AMARANTACEÆ.

** Euxolus Mitchelli. Beresford Springs!; Warburton River!; Strzelecki Creek!; Innaminka!

Ptilotus alopecuroides. Innaminka!

** exaltatus. Lake Frome!; Peake!

** Murrayi. Wills Creek *(Howitt)*

** parvifolius. Stuart Creek *(Babbage)!*; Farina!

** latifolius. Warburton River!; Strzelecki Creek!; Wills Creek *(Howitt)*

** incanus. Warburton River!

O. E Alternanthera triandra. Strzelecki Creek!; the Hamilton!; Lake Frome!; Warburton River!

** Polycnemon Mesembrianthemum. Lake Eyre *(E. Giles)*

ORDER CHENOPODIACEÆ.

Rhagodia crassifolia. Lake Eyre *(Lewis)*.

nutans. Lake Eyre *(E. Giles)*; Innaminka!

* spinescens. Between Hergott and Strangways!

** Chenopodium auricomum. Cootanoorrinna!

* cristatum. Warburton River!; Beresford Springs!

** Atriplex nummularium. Between Hergott and Straugways!

** rhagodioides. Strangways!

* vesicarium. General on west side!

** velutinellum. Stuart Creek *(Babbage)*.

** halimoides. Lake Eyre *(Lewis)*; towards Cooper Creek *(Howitt)*.

** holocarpum. General on west side!

angulatum. Strangways Springs!

** Atriplex fissivalve. Cootanoorrinna! A more or less succulent herb, the branches and foliage covered with watery shining papillæ, as in *A. crystallinum*. Perianth with a foliar toothed appendage on each valve, similar to the valve.
** leptocarpum. Warburton River!
Dysphania littoralis. South of Wills Creek *(Howitt)*.
** simulans. Cootanoorrinna!
Enchylæna tomentosa. Strzelecki Creek!
** Bassia bicornis. Cooper Creek *(Dr. Murray)*.
** lanicuspis. Cootanoorrinna!
** bicuspis. Between Stokes Range and Cooper Creek *(Wheeler)*.
diacantha. Warburton River!
** uniflora. Cootanoorrinna and Nilpinna!
** quinquecuspis. Warburton River!
** Babbagia dipterocarpa. Stuart and Elizabeth Creeks *(Babbage)*; Paralana, Lake Frome!; gypsum flats, west side of Lake Eyre!
** acroptera. Warburton River!
** Kochia lanosa. Warburton River!; between Hergott and Strangways!
** eriantha. Between Stokes Range and Cooper Creek *(Wheeler)*.
aphylla. Between Hergott and Strangways!
** sedifolia. Strzelecki Creek!; Paralana!
villosa. Peake!
** ciliata. The Margaret *(Babbage)*; Strzelecki Creek!
appressa. The Margaret *(Babbage)*.
** brachyptera. Cootanoorrinna!
cos. Salsola kali. Between Stokes Range and Cooper Creek *(Howitt)*.
Salicornia australis. Salt flats, very generally distributed!
arbuscula. Salt flats, very generally distributed!
** leiostachya. Lake Eyre *(Lewis)*; Lower Barcoo River *(Howitt)*.

ORDER FICOIDEÆ.

E. Asia, Andean. Tetragonia expansa. Innaminka!; Warburton River!
** Aizoon quadrifidum. Strzelecki Creek! Warburton River!
** zygophylloides. Mount Margaret *(Babbage)*.
** Gunnia septifraga. Stuart Creek (*Babbage*).
o.e. Zaleya decandra. Between Cooper and Wills Creek (*Dr. Murray*).
o.e. Trianthema crystallina. Cootanoorrinna!
** Mollugo orygioides. Cooper Caeek (*Wright*).
Glinus. Strzelecki Creek and Innaminka!

ORDER POLYGONACEÆ.

** Rumex crystallinus. Beresford Springs !; Strzelecki Creek !; Innaminka !

o. Polygonum plebejum. Innaminka !; Strzelecki Creek !
attenuatum. Innaminka !
Muhlenbeckia Cunninghami. Innaminka !; Hergott to Strangways !; William Springs !, &c.

ORDER NYCTAGINEÆ.

o.e. Bœrhaavia diffusa. Peake !

o. repanda. Paralana !; Lake Eyre (*E. Giles*).

ORDER LEGUMINOSÆ.

** Isotropis Wheeleri. Between Stokes Range and Cooper Creek (*Wheeler*).
Crotalaria Cunninghami. Between Hergott and Strangways !; Priscilla sandhills !; Strzelecki Creek !

** dissitiflora, var. eremæa. Very general !

* Mitchelli. Wills Creek (*Howitt*); Strzelecki Creek !

** Trigonella suavissima. Warburton River !; Strzelecki Creek !; Beresford Springs !
Lotus australis, var. Peake !; Innaminka !; Table land north of Callana !
Psoralea patens. Between Hergott and Strangways ! Warburton River !

** Indigofera brevidens. Peake !; Cooper Creek (*A. C. Gregory*).

o.e. viscosa. Anna Creek !

o.e. hirsuta. Warburton River !

o. Sesbania aculeata. Cooper Creek (*Howitt*).
Swainsonia phacoides. Warburton River !; south of Wills' Creek (*Howitt*); Innaminka !

** oligophylla. Cooper Creek (*A. C. Gregory*).

** campylantha. Cooper Creek (*A. C. Gregory*); Peake !; crabholes, Beresford Springs !

** phacifolia. John Creek !; Strzelecki Creek !
oroboides. Cooper Creek (*Howitt*).
procumbens. Between Hergott and Strangways !

** Glycine falcata. Cooper Creek (*Bowman*).

** sericea. Between Stokes' Range and Cooper Creek (*Wheeler*). Innaminka !

o. tomentosa. Cooper Creek (*Howitt*).

o.e. Æschynomene Indica. Beresford Springs !; seven miles from Strangways !

Vigna lanceolata. Anna Creek !
** Cassia pruinosa. Between Stokes' Range and Cooper Creek (*Wheeler*).
** pleurocarpa. West of Lake Eyre (— *Giles*).
phyllodinea. Between Hergott and Strangways !
eremophila. Warburton River !
** Sturtii. Peake ! ; Strzelecki Creek to Lake Frome !
* desolata. Innaminka ! ; Hamilton Creek, south end of Strzelecki !
* Petalostylis labicheoides. John Creek !
** Bauhinia Carroni. Towards Cooper Creek (*Howitt*).
** Acacia Peuce. North of Wills' Creek (*Howitt*).
** cyperophylla. Cooper Creek (*A. C. Gregory*).
** Murrayana. Cooper Creek (*Dr. Murray*).
tetragonophylla. South of Callana !
** Oswaldi, stenophylla } Cooper Creek (*Victorian Exped.*).
** Sentis. Strzelecki Creek !
** doratoxylon. Cooper Creek (*Herb. F.V.M.*).
T Farnesiana. Cooper Creek (*Victorian Exped.*).

ORDER CRASSULACEÆ.

A Tillæa verticillaris. Innaminka !

ORDER MYRTACEÆ.

** Melaleuca hakeoides. Cooper Creek (*Dr. Beckler*).
** trichostachya. Cooper Creek (*Howitt*).
** Eucalyptus microtheca. Cooper Creek (*Howitt*) ; Wooltana !
rostrata. Flooded watercourses, general.

ORDER HALORAGEÆ.

Haloragis ceratophylla. Warburton River !

ORDER LYTHRACEÆ.

O. E Ammannia baccifera. Cooper Creek (*Howitt*).

ORDER THYMELEÆ.

* Pimelea microcephala. Innaminka ! ; Strzelecki Creek !
** trichostachya. Innaminka !

ORDER PROTEACEÆ.

** Grevillea pterosperma. Cooper Creek (*Howitt*).
** juncifolia. North of Lake Eyre (*Sturt*).
striata. Cooper Creek (*Howitt*).
** nematophylla. William Tableland and south of Callana !

** Hakea leucoptera. Strzelecki Creek! ; Cooper Creek (*Dr. Murray*).

ORDER LORANTHACEÆ.

Loranthus Exocarpi linophyllus } Cooper Creek (*Howitt*).
** gibberulus. William Tableland!
pendulus.
grandibracteatus. Cooper Creek (*Vict. Exped.*)
* Quandang. Cooper Creek (*Howitt*).
o. Viscum articulatum.

ORDER SANTALACEÆ.

Santalum lanceolatum. South of Callana!

ORDER UMBELLIFERÆ.

** Didiscus glaucifolius. Strzelecki Creek!
** Eryngium plantagineum. Innaminka; Strzelecki Creek; Paralana and John Creek!
Dauchus brachiatus. Strzelecki Creek!

ORDFR RUBIACEÆ.

** Oldenlandia tillæacea. Innaminka!; Strzelecki Creek!; Warburton River!
o. Dentella repens. Between Stokes Range and Cooper Creek (*Wheeler*).

ORDER COMPOSITÆ.

** Podocoma cuneifolia. Hamilton Creek!; between Hergott and Strangways!
Minuria leptophylla. Innaminka!; Strzelecki Creek!; Peake!
suædifolia. Stuart Creek (*Babbage*).
** integerrima. Warburton River!; Innaminka!
** denticulata. General, from Hergott to Peake!
Cunninghami. Between Hergott and Strangways!
** Calotis cymbacantha. Innaminka!; Strzelecki Creek!
erinacea. Nilpinna flats!; Innaminka!
lappulacea. Warburton River!
** plumulifera. Cootanoorrinna!; Innaminka and Strzelecki Creek!
** porphyroglossa. Innaminka!
hispidula. Innaminka!; Warburton River!; Peake!
Brachycome pachyptera. Innaminka!
ciliaris. Innaminka!; Strzelecki Creek!; Strangways!; Cootanoorrinna!
** melanocarpa. Innaminka!

Pterocaulon sphacelatus. Innaminka ! ; Hamilton Creek ! ; Peake !

Pluchea Eyrea. Strzelecki Creek ! ; Hergott to Strangways ! ; Nilpinna flats, between sandhills !

** Erodiophyllum Elderi. Strzelecki Creek and Wooltana !

FORMOSA. Epaltes australis. Innaminka !

Cunninghami. Warburton River !

** Pterigeron liatroides. Strangways (*Stuart*) ; Beresford Springs and Peake !

Flaveria australasica. Hergott ; Tableland north of Callana ; William Springs ; and Peake !

Med., S. Africa, Andean. } Cotula coronopifolia. John Creek !

** Centipeda thespidioides. Stuart Creek (*Babbage*) ; Strzelecki Creek !

O. orbicularis. Innaminka !

** Cunninghami. Strzelecki Creek !

** Myriocephalus Rudalli. Strzelecki Creek !

* Stuartii. Innaminka and Strzelecki Creek !

** Gnephosis eriocarpa. Innaminka ; Strzelecki Creek ; and Warburton River !

** codonopappa. Beyond Lake Eyre (*E. Giles*).

** arachnoidea. Strzelecki Creek !

Craspedia chrysantha. Innaminka !

pleiocephala.

** Calocephalus platycephalus. Strzelecki Creek !

** Rutidosis helichrysoides. Innaminka and Warburton River !

** Millotia Greevesii. Innaminka ! ; Peake !

Ixolæna tomentosa. Lake Eyre (*E. Giles*).

leptolepis. Hergott to Strangways ! ; Innaminka !

Podolepis canescens. Innaminka and Strzelecki Creek ! ; Warburton River !

rutidochlamys. Innaminka !

* Siemssenia. Strzelecki Creek ! ; Hergott to Strangways !

Leptorhynchos pulchellus. Strzelecki Creek !

Helichrysum apiculatum. Innaminka !

** semifertile. Innaminka ! ; Strzelecki Creek !

** podolepideum. Peake !

* Helipterum floribundum. Innaminka, ; Strzelecki Creek ; and Peake !

** pterochætum. Stuart Creek (*Babbage*).

** strictum. Warburton River ! ; Stokes' Range to Cooper Creek (*Wheeler*).

moschatum. Innaminka ; Strzelecki Creek ; Peake ; and Warburton River !

corymbiflorum. Innaminka and Strzelecki Creek !

Helipterum incanum. Warburton River !
exiguum. Strzelecki Creek !
hyalospermum. Innaminka !

** Senecio Gregori. Warburton River; Innaminka; and Strzelecki Creek !
lautus. Innaminka !; Hergott to Strangways !
brachyglossus. Warburton River !; Innaminka !

* Cunninghami. Warburton River and Innaminka !

cos. Gnaphalium luteo-album. Innaminka and Strzelecki Creek !

ORDER CAMPANULACEÆ.

Lobelia Benthami. Cooper Creek (*Bowman*).

** Isotoma petræa. John Creek and Tooth-knob, Lake Frome !

o. Wahlenbergia gracilis. Innaminka; Strzelecki Creek; and Warburton River !

ORDER GOODENOVIEÆ.

** Leschenaultia divaricata. Cooper Creek (*Wheeler*); Anna Creek !

Goodenia glauca. Warburton River !; Strzelecki Creek !; Strangways !; Peake !

** cycloptera. Peake !; Warburton River !

** Mitchelli. Lake Eyre (*E. Giles*).

** heteromera. Strangways !

** microptera. Warburton River !

* Scævola spinescens. Innaminka !; Strzelecki Creek !

** depauperata. Cooper Creek (*Wheeler*).

** collaris. Lake Eyre (*E. Giles*); Warburton River !

* ovalifolia. Strzelecki Creek !; Cooper Creek (*Howitt*); Lake Eyre (*Lewis*).

ORDER GENTIANEÆ.

LOOCHOO. Erythræa australis. Innaminka and Strzelecki Creek!

ORDER PLANTAGINEÆ.

Plantago varia. Warburton River !; Innaminka !

ORDER ASCLEPIADEÆ.

** Cynanchum floribundum. Cooper Creek (*Howitt*).

** Marsdenia Leichhardtiana. John Creek !

* Sarcostemma australis. Tableland around Lake Eyre !

ORDER SOLANACEÆ.

cos. Solanum nigrum. Hergott to Strangways !

* esuriale. Hergott to Strangways !

** chenopodinum. Cooper Creek (*Howitt*).

** Sturtianum. Innaminka and John Creek !

* eremophilum. Hergott to Strangways!; Beresford Springs!; Peake!
** lacunarium. Lake Eyre (*E. Giles*).
* ellipticum. Innaminka!; Peake!
** orbiculatum. Warburton River!
Nicotiana suaveolens. Warburton River!; Innaminka!; Strzelecki Creek!; Peake!

ORDER SCROPHULARIACEÆ.

** Mimulus prostratus. Strzelecki Creek!
* Stemodia Morgania. Warburton River; Innaminka, and Strzelecki Creek!
** Peplidium Muelleri. Lake Eyre.

ORDER ACANTHACEÆ.

T Justicia procumbens. Innaminka!; Strzelecki Creek!; Peake!

ORDER PEDALINEÆ.

** Josephinia Eugeniæ. Near Cooper Creek (*Bowman*).

ORDER CONVOLVULACEÆ.

Convolvulus erubescens. Innaminka!
T Evolvulus linifolius. Cooper Creek (*Howitt*).
** Breweria media. Cooper Creek.
** Polymeria longifolia. Cooper Creek.
** angustata. Cooper Creek.

ORDER OROBANCHACEÆ.

Orobanche australiana. John Creek, Lake Frome!

ORDER BORAGINEÆ.

O.E. Coldenia procumbens. Cooper Creek (*Howitt*).
S. Africa, N. and S. America. } Heliotropium Curassavicum. Warburton River!; John Creek!
MED. undulatum. Near Lake Eyre (*Lewis*).
* asperrimum. Beresford Springs! Hergott to Strangways!; John Creek!
O.E. ovalifolium. Innaminka!
** filaginoides. Cooper Creek (*Howitt*).
Halgania cyanea. Innaminka!
O.E. Pollichia Zeylanicum. Cooper Creek (*Howitt*); Strzelecki Creek!
Echinospermum concavum. Stokes' Range to Cooper Creek (*Wheeler*).
* Cynoglossum Drummondi. Innaminka and Strzelecki Creek!

ORDER LABIATÆ.

Mentha australis. Innaminka, Strzelecki Creek, and north of Strangways !

** Prostanthera striatiflora. Towards Cooper Creek (*Wheeler*); Wooltana !

Teucrium racemosum. Warburton River !; Cooper Creek (*Howitt*); Strangways and Beresford Springs !

ORDER VERBENACEÆ.

* Verbena macrostachya. Warburton River, Innaminka and Strzelecki Creek !

** Newcastlia spodiotricha. Eyre Creek (*Kayser*).

ORDER MYOPORINEÆ.

Myoporum Cunninghami. Strzelecki Creek !

** Eremophila Dalyana. Stokes' Range to Cooper Creek (*Wheeler*).

** Sturtii. Hamilton Creek !

** Latrobei. Cooper Creek (*Howitt*); Cootanoorrinna !

** MacDonnelli. Strzelecki Creek !; Paralana !

** Freelingi. Innaminka !; Strzelecki Creek !; Cootanoorrinna !; Peake !

** Goodwini. Stokes' Range to Cooper Creek (*Wheeler*); beyond Lake Eyre (*E. Giles*).

** Duttoni. Cooper Creek (*Wright*).

** polyclada. North-east of Lake Eyre (*Sturt*).

** maculata. Strzelecki Creek !; Innaminka !; Lake Eyre (*E. Giles*).

Brownii. Innaminka !

** latifolia. North of Strangways Springs !

** bignoniflora. Strzelecki Creek !

** Bowmani. Cooper Creek !

* scoparia. South of Callana !; about Lake Eyre (*E. Giles*).

ORDER ORCHIDEÆ.

Cymbidium canaliculatum. Cooper Creek (*Herb. F.v.M.*).

Caladenia deformis. Strzelecki Creek !

ORDER AMARYLLIDEÆ.

** Crinum flaccidum. Cooper Creek (*Vict. Exped.*); Strzelecki Creek !

Calostemma luteum. Mount Margaret (*Stuart*); Cooper Creek (*Neilson*).

ORDER LILIACEÆ.

Wurmbea dioica. Between Lake Eyre and River Finke (*E. Giles*).
Bulbine semibarbata. Warburton River! ; Innaminka! ; John Creek!
Tricoryne elatior. Cooper Creek (*Vict. Exped.*).
** Thysanotus exiliflorus. Innaminka!

ORDER NAIADEÆ.

Triglochin centrocarpa. Warburton River!

ORDER JUNCACEÆ.

Juncus planifolius. Strzelecki Creek!

ORDER CYPERACEÆ.

Cyperus gracilis, subulatus } Lake Eyre (*Andrews*).
fulvus. Beresford Springs!
o eragrostis. Strzelecki Creek!
** Gilesii. Innaminka!
o difformis. Beresford Springs!
o.e. Iria. Beresford Springs! ; Innaminka!
t Fimbristylis ferruginea, velata } Warburton River!
cos Scirpus lacustris. John Creek!
cartilagineus. Innaminka!

ORDER GRAMINEÆ.

** Panicum reversum
** coenicolum
W. Indies adspersum } Near Lake Eyre (*Andrews*).
o distachyum
o.e. Panicum helopus. General on west side of Lake Eyre!
decompositum. Lake Eyre (*Andrews*) ; Cooper's Creek (*Howitt*).
t. leucophœum. Cooper Creek (*Vict. Exped.*).
Mitchelli. Cooper Creek (*Howitt*).
effusum. Hergott to Strangways!
o.&c. Setaria viridis. Anna Creek and tableland near Strangways Springs!
** Pennisetum refractum. Cooper Creek (*Howitt*).
** Spinifex paradoxus. Near Lake Eyre (*Andrews*); Warburton River!
o. Eriochloa annulata. Cootanoorrinna, and generally about west side of Lake Eyre!
o. Perotis rara. Towards Cooper Creek (*Neilson*).

o.&c. Lappago racemosa. Hergott to Strangways ! ; Warburton River !
Erianthus fulvus. Anna Creek ! ; near Lake Eyre (*Andrews*).
o. Andropogon punctatus. Callana !
o. sericeus. Lake Eyre (*Andrews*).
exaltatus. Callana ! ; Lake Eyre (*Andrews*).
** Anthistiria membranacea. Cootanoorrinna, and general on west side of Lake Eyre !
o.E. ciliata. West side of Lake Eyre !
** avenacea.
Aristida stipoides. Strzelecki Creek ! ; Lake Eyre (*Andrews*).
arenaria. Warburton River !
Stipa semibarbata. Innaminka !
Pappophorum commune. Hergott to Strangways ! ; Beresford Springs ! ; Warburton River !
** Astrebla pectinata. Hergott to Strangways !
** triticoides. Lake Eyre (*Andrews*).
Triraphis mollis. General on west side of Lake Eyre !
** Chloris acicularis. Anna Creek !
o.&c. Eleusine cruciata. Hergott to Strangways !
* Sporobolus Lindleyi. General on west side of Lake Eyre !
** actinocladus. Cootanoorrinna !
** Eriachne aristidea. Lake Eyre (*Andrews*).
ovata. Lake Eyre. (*Andrews*).
Eragrostis concinna. Lake Eyre (*Andrews*).
speciosa. Hamilton River (*Stuart*).
** laniflora. Beresford Springs !
** chætophylla
** lacunaria } Lake Eyre (*Andrews*).
** falcata
** trichophylla. Hergott to Strangways ! ; Cootanoorrinna !
sp. Anna Creek.
T. Festuca fusca. Lake Eyre (*Andrews*).
* Trodia irritans. General on stony and sandy ground !
** Poa ramigera. Anna Creek !

ORDER MARSILEACEÆ.

MED. Marsilea quadrifolia. Innaminka ! ; Strzelecki Creek !

ORDER FILICES.

O. Cheilanthes tenuifolia. Innaminka ! ; Mount Nor'-West !
MED. vellea. Innaminka ! ; Lake Eyre (*Andrews*).
MED. A. Grammitis rutæfolia. Innaminka ! ; Mount Nor-West !
COS. Ophioglossum vulgatum. Strzelecki Creek !

On Some New South Australian Coccidæ.

By W. M. Maskell, F.R.M.S.

[Read July 3rd, 1888.]

Plates XII. to XIV.

The following paper contains detailed descriptions of some insects which Mr. F. S. Crawford, of Adelaide, has kindly sent to me. They are all, in various ways, interesting, and some of them are quite peculiar. It would be desirable that some systematic investigations should be made amongst the Australian Homoptera. This field has hitherto been very little worked, and, from these and other specimens which have come under my notice, I believe that a student of this very curious Order will find in Australia ample opportunities for most interesting work. All these insects have some peculiar features of their own well worth examination. If nobody in their native country cares to undertake the task, I shall be very happy to do what I can if specimens are sent to me.

On this I may mention, as a guide both to those who would like themselves to study Coccids and to those who might be good enough to send insects for identification, that two things are necessary. First, care must be taken to procure specimens, if possible, in all stages of existence; secondly, attention should be directed by a student to the determination of minute points of anatomy. The first is required because a Coccid, in very many cases, is quite different in different states of life; the female is quite unlike the male, the larva is often no guide whatever to the form of the adult. The second is requisite because, without minute examination, errors may very easily arise; for example, *Monophlebus Crawfordi*, herein described, in outward appearance very closely resembles, as to the female, *Cælostoma Zealandicum*, and, as to the male, *Icerya Purchasi*. The minute rostrum of the female and the tassels of the male are distinguishing characters, to be made out only with a strong lens or the microscope. These remarks may perhaps seem to some superfluous, yet they contain points of the greatest importance for the study of Homoptera, especially Coccids.

FAMILY COCCIDIDÆ.

GROUP—DIASPIDINÆ.

Genus—Aspidiotus, *Bouché.*

Female puparium varying in colour, circular in outline, usually flat, sometimes rather convex ; pellicles central.

Male puparium elongated, not carinated ; pellicle at one end.

Aspidiotus eucalypti, sp. nov. Plate xii., fig. 1.

Female puparium (figs. 1 and *a* and *b*), circular, slightly convex, dirty-white in colour ; diameter averaging $\frac{1}{12}$ inch. The pellicles in the centre are very inconspicuous.

Male puparium *(c)* narrow, elongated, semi-cylindrical ; colour white, the pellicle yellow ; not carinated above. Length nearly $\frac{1}{18}$ inch.

Adult female (*d*) of the usual pegtop-shape of the genus, but with a deep transverse groove about one-third of the distance from the cephalic extremity, which divides it into two unequal portions. The other segments are not conspicuous. Colour dark brown. The abdomen is not overlapped by the anterior segments as in some species. Length, $\frac{1}{18}$ inch ; diameter almost the same. Abdomen (*e*) ending in two median lobes, and at each side some short fine hairs. No groups of spinnerets, but rows of spinnerets are arranged along the last three segments, and there are a few others scattered. After pressure, as shown in the figure, the pygidium is seen to extend for some distance within the edge of the abdomen, and is of a bright yellow.

Adult male not known.

The puparia of the females are found thickly aggregated in masses on the bark, with the males interspersed.

This species is clearly distinguished by the deep transverse groove on the female, as shown in figs. *b* and *d*. The male puparium is also narrower, and more cylindrical than usual.

Habitat.—On Eucalyptus (various kinds), South Australia ; often found intermingled with the next insect, *Chionaspis assimilis.*

Genus—Chionaspis, *Signoret.*

Female puparium usually, but not always, white ; elongated, generally nearly flat ; pellicles at one end.

Male puparium elongated, white, carinated ; pellicle at one end.

Chionaspis assimilis, sp. nov. Plate xii., fig. 2.

Female puparium (figs. 2 and *a* and *b*) elongated, pyriform, slightly curved, scarcely convex ; colour dark brown, the pellicles at one end yellow. Length, about $\frac{1}{10}$ inch.

Male puparium (*c*) brownish-white, narrow, semi-cylindrical; pellicle yellow. Length, $\frac{1}{16}$ inch.

Adult female (*d*) of the usual elongated form of the genus, the cephalic region smooth, the abdomen with conspicuous segments; colour brown. Length, about $\frac{1}{15}$ inch. The abdomen (*e*) ends in two median lobes with at each side a few spines; pygidium exhibiting five groups of spinnerets, but only two or three in each group.

The larva (*f*) is of the normal form of the Diaspid group, but the rostrum, as shown in the figure, appears to be abnormally large.

Habitat.—On Eucalyptus (various), South Australia.

This insect approaches very nearly *C. euonymi*, Comstock (Report of the Entomologist, U.S. Dept. of Agric., 1880, p. 313), especially in the small number of spinnerets in the groups; but it differs in colour in the lobes of the abdominal extremity, and in the absence of a "ventral scale" in the puparium.

Group—Lecanidinæ.

subdivision—lecanidæ.

Genus—Pulvinaria, *Targioni.*

Female insects naked, arboreal, constructing a cottony ovisac: exhibiting an abdominal cleft and dorsal lobes at all stages. Male pupæ in cottony or waxy tests.

Pulvinaria flavicans, sp. nov. Plate xii., fig 3.

Adult female (figs. 3 and *a*), yellowish-brown in colour, not globular or gall-like, but slightly convex, rugose; outline sub-elliptical; naked, but producing a quantity of white cotton, which surrounds its edges, looking like a cushion on which the insect reposes; but on turning it over the ventral surface is seen to be bare, so that the insect rests rather on a ring of cotton. General form normal of the Lecanid group, exhibiting the abdominal cleft and dorsal lobes, but the cleft (*b*) is shallow and wide. Round the edge of the body is a row of spines, short and not very close together. Antennæ of apparently eight joints (*c*), but the division shown in the figure at *c* may be a "false joint," as in some other Lecanidæ, and the antenna may have really seven joints. Assuming eight as the number, all the joints are sub-equal in length, with a few short hairs; on the last joint is one hair about three times as long as the others. Feet (*d* and *e*) with somewhat thick femur, the tibia and tarsus slender; upper pair of digitules, with long, fine, knobbed hairs, lower pair rather longer than the claw, and slightly dilated at the tips. Anogenital ring *(f)* with many hairs. Rostrum short and thick:

mentum monomerous. On the ventral surface are many spinnerets, narrow projecting tubes, which are most numerous at the edges and near the posterior extremity.

Second stage of female not observed.

Larva (*g*) active; body elongated, very indistinctly segmented; colour brownish-yellow. Abdominal cleft and dorsal lobes present. The lobes are somewhat long, so that some larvæ seem almost to have anal tubercles; setæ long and thick. Antennæ (*h*) rather disproportionately large, with six joints, of which the third is the longest, the rest sub-equal; one or two short hairs on most of the joints, and one the last, which is fusiform, several hairs, of which one is very long, almost equal in length to the whole antenna. Feet also large and long, all the joints thick; the tibia is longer than the tarsus (an exceptional character in a larva); digitules, both upper and lower. Knobbed hairs. Anogenital ring (*i*) with eight hairs. A few short spines round the edge of the body.

Male in all stages unknown, but on the twig examined, amongst a number of females, there were a few empty, broken, glassy tests, of the usual form of Lecanidæ; these seem undoubtedly the tests of male pupæ.

This appears to be clearly a *Pulvinaria*, and differs in a few particulars from described species. The cottony ovisac is shorter and more ring-shaped than usual in the genus. But the species of *Pulvinaria* have not been diagnosed with sufficient completeness. *P. vitis*, Linn., *P. artemisiæ*, Licht., and *P. oxyacanthæ*, Linn., exhibit characters found in the South Australian insect.

Group—Coccidinæ.

Subdivision—Acanthococcidæ.

Genus—Eriococcus, *Targioni-Tozzetti.*

Adult females enclosed in a sac of felted cotton; body elongated, segmented; anal tubercles conspicuous.

Amongst the characters hitherto ascribed to this genus are an elongation of the sac and a number of spines on the dorsum, and the sac is usually so clearly cottony as to present no difficulties. The insect about to be described is abnormal in both particulars, but other characters seem to place it in this genus—indeed, it agrees with no other—and it is therefore so allocated here. It presents several features of considerable interest.

Eriococcus paradoxus, sp. nov. Plate xiii., fig. 4.

Sac of adult female (figs. 4 and *a*) dark reddish brown, circular, convex, aggregated in masses on the bark, and so thickly covering it sometimes as probably to smother the plant; diameter about

$\frac{1}{8}$ inch. The aggregated mass is so thick that on cutting a vertical section it appears like a honeycomb of cells (*b*), each containing an insect. At the summit of the convex sac is a very minute orifice (not apparent in every instance). This orifice (shown in fig. *a*) is probably intended to give access to the male insect, specimens of which may sometimes be found inside the cellular sacs with the females. The sac is so closely fitted that it has quite the appearance of being waxy instead of cottony, but a little pressure with the point of a pencil makes an impression in it as if it were leathery ; and on boiling in potash it becomes dissolved, which is not the case with any waxy coccid test, as far as I know. The spinnerets and threads described below are also evidences that the sac is really felted, though very closely.

The sac of the male (*c* and *d*) is reddish-yellow, narrow, elongated, convex above and flat beneath ; after its last metamorphosis the male escapes by an orifice at one end.

Adult female (*e*) somewhat pegtop-shaped, the cephalic region large and smooth, the abdomen small, segmented and tapering to the two anal tubercles, which are prominent, and bear each a long seta. Colour dark reddish-brown ; length, exclusive of the tubercles, about $\frac{1}{10}$ inch. On maceration and boiling in potash the anatomical details can be made out. On the cephalic region, as shown in the diagram (*f*), there are four bands of very small, circular spinneret orifices (shown enlarged in fig. *g*); these bands correspond with the position of the four stigmata of the body. On the abdominal segments there are rows of double, or figure-of-eight, spinnerets (fig. *h*, and enlarged fig. *i*); many of these also are scattered over the cephalic region. From these double spinnerets spring long white curling threads (*k*, *l*), which form the felted sac. The rostrum (*m*) is conical, and the mentum (*n*) is bi-articulate. The antennæ (*o*) are atrophied and very short ; the number of joints cannot be clearly made out, owing to compression, which confuses them ; but the normal number in the genus is six, and probably this is the case here also. The tip bears a few strong short hairs. The feet are entirely absent.

The second stage of the insect has not been observed.

The larva, just after leaving the egg, is of the normal shape of the genus (*p*)—elongated, flattish, tapering slightly posteriorly ; exhibiting the anal tubercles. Colour reddish ; length about one-fortieth of an inch. Antennæ (*q*) of six sub-equal joints, all slightly dilated at the end except the last, which is irregular and pointed, and bears some hairs ; all the joints appear to be numerously ringed. Feet normal. On the body there are four longitudinal rows of figure of eight spinnerets (*r*). The anal tubercles bear long setæ.

Adult male (*s*), red ; somewhat short and squat ; the thorax

broad, and the abdominal segments compressed. Length of the body, about one-fortieth of an inch. The last segment of the abdomen bears on each side three longish setæ. Antennæ (*t*) of ten joints, the first very short, the rest sub-equal, elliptical, except the second, which is dilated at the tip ; all the joints bear hairs. Feet (*v*) slender ; upper digitules long and slender, lower pair short ; fine hairs. Abdominal spike (*w*) conical, pointed.

Habitat.—On Pittosporum undulatum. South Australia.

This is an anomalous and peculiar insect, and if the joints of the antennæ, in the adult female, have really more than six joints, as they may well have, it must be removed from the genus *Eriococcus*. The absence of the feet is also an abnormal character. In general outline the female resembles the New Zealand insect *Eriococcus hoheriæ*, but in that the feet are present, though atrophied.

Group—Coccidinæ.

subdivision—dactylopidæ.

Genus—Ripersia, *Signoret.*

Adult females stationary, excreting much white meal and cotton ; antenuæ of six joints ; anogenital ring with six hairs ; anal tubercles present but, in the adult, not conspicuous.

Ripersia leptospermi. sp. nov. Plate xiv., fig. 5.

Adult female flattish, a little raised and carinated on the dorsum ; outline sub-circular, or if in a depression of the leaf proportionately compressed ; colour dark purple, covered with white meal ; producing rich red colour when immersed in potash. From the edge of the body radiate all round a large number of very long, fine, white, cottony, curling filaments which are also slightly arched, forming a kind of bower, under which is a mass of more granular cotton, slightly tinged with yellow, in which the eggs are laid and hatched. The filaments are in tufts set close together, and their average length is about twice the diameter of the insect. Antennæ (*a*) of six joints, of which the two first are very short, the last three sub-globular and sub-equal, and the third nearly half as long as the whole antenna ; on the last joint are a few short conical bristles, on the third are two hairs, and one or two hairs on the rest. A "false joint" occurs on the third joint, as in some Lecanidæ. Feet (*b*) very long and slender ; the tibia very little longer than the tarsus ; claw slender ; upper digitules long knobbed hairs, lower digitules short and very fine. Rostrum (*c*) short ; mentum dimerous. The body has twelve inconspicuous segments, and at the edge is a row of twenty-four groups of large projecting tubular spinnerets with wide bases (two to each segment), from which spring the tufts of long, white, cottony

filaments (figs 1 and *d*). On the epidermis are other spinneret orifices, circular and not projecting, from which the yellower cottony mass is excreted. Anal tubercles inconspicuous with short setæ. Average diameter of the body, $\frac{1}{30}$ inch; average diameter from tip to tip of the cottony filaments, $\frac{1}{8}$ inch.

Second stage of the female not observed.

Larva just hatched (*e*) active, elongated, dark purple in colour, slightly dusted with white meal; body segmented; anal tubercles conspicuous, with long setæ. Antennæ (*f*) of probably four joints, but the joints are not easily distinguished. Feet thick, apparently normal. Length of body, about one-fiftieth of an inch.

Male in all stages unknown.

This insect is evidently a Dactylopid, from the character of the anal tubercles, the six-haired anogenital ring, and the general form of the adult female. It is referred to the genus *Ripersia*, on account of the six-jointed antennæ. Only one species of the genus appears to have been described hitherto (*R. corynephori*, Signoret); but this seems to have nothing like the arched fringe of long white cottony filaments, and its colour is yellow. Other distinctions are in the form of the antennæ, the digitules of the foot, and the character of the spinnerets. The South Australian insect appears to be clearly distinct.

Group—Coccidinæ.

subdivision—monophlebidæ.

Hitherto a distinguishing character of this subdivision has been the possession of ten or eleven joints in the adult female. For this reason Signoret expressed doubts whether the specimens observed of the insect *Drosicha contrabens*, Walker (from Ceylon), which had only nine joints, were really adult females; and, having in view these doubts, I attached, in my "Scale Insects of New Zealand," the genus *Drosicha* with *Monophlebus*. It is quite clear, from the following account of a new species, that the subdivision must be extended as regards this character, and perhaps *Drosicha*, when again observed, may be found to be really as Walker originally described it.

Genus—Monophlebus, *Leach*.

Adult female with nine (or eleven?) joints in the antennæ; adult male with several long tassels on the abdominal segments.

A curious point about this is that, whilst all authors give generic characters for the females of *Monophlebus*, not one seems to have ever described, or perhaps observed, a female, at least so far as to determine its more minute features. Westwood and Leach possessed apparently specimens; and from their general

outward similarity to the females of *Porphyrophora*, *Guerinia*, &c., probably the eleven-jointed antennæ has been taken for granted. The males of several species of *Monophlebus* are described, chiefly as inhabiting the East Indies. In *Cœlostoma*, an allied New Zealand genus, the antennæ have undoubtedly eleven joints; so also in *Icerya*. As far as I know, the following is the first published *detailed* description of a female *Monophlebus*, and it is interesting, as it necessitates the revision just noted of the characters of the genus.

Monophlebus Crawfordi, sp. nov. Plate xiv., flg. 6.

Adult female (figs. 1, *a* and *b*) brick-red in colour, with two broad longitudinal stripes of purple extending the whole length on the dorsal side and on the abdominal segments beneath. The body is slug-like, fat, and distinctly segmented with twelve divisions; somewhat convex above and flat beneath. The cephalic and thoracic region occupies half the length, so that the feet seem placed rather in a forward position, and the insect crawls slowly. There is a quantity of white, short, cotton covering the insect, and at gestation this is heaped in large masses containing the eggs. The antennæ (*c*) are tapering, with nine joints, the first and second are wider and shorter than the rest which are sub-equal except the last which is elongated oval; each joint bears some hairs. At the base of the antenna is situated the eye (shown in fig. *c*); this is small, tubercular, not facetted but with a central orifice or spot. The feet (*d*) are not very strong; the tibia is more than twice as long as the tarsus; the trochanter bears one long seta; all the joints have hairs, and on the under-side of the tibia is a series of short spiny hairs or bristles; the upper digitules appear to be absent, the lower pair being short, fine hairs. The rostrum is very minute, but may be clearly made out in a deep hollow between the anterior pair of feet (it is indicated in fig. *b*); it is conical (*e*) and appears to have no mentum. At the tip there are some short hairs, but no long setæ, as in most coccids. The body of the insect is covered with short, fine, spiny hairs, intermingled with small circular spinneret-orifices.

The second female stage has not been sent to me. Judging by analogy, this will probably be found (as in the allied New Zealand genus *Cœlostoma*) to be encased in a large waxy test, and stationary on some plant. But, unless searched for by some one more or less familiar with the peculiar variations of coccids, which are generally not a little puzzling, it may not be found for some time; and analogy may be misleading, so that this second stage may really be something resembling the adult. It would be interesting to clear up the doubt, the metamorphoses of coccids being one of the most curious features of the family.

The adult male (*f*) is a fine insect, rather larger than usual amongst coccids, the body measuring almost $\frac{1}{9}$ inch and the expanded wings $\frac{2}{5}$ inch. It is not, at first sight, unlike the male of the allied genus *Icerya* (*I. Purchasi*, the cottony-cushion scale), having a red body and dark-brown wings. But the characteristic feature of the genus *Monophlebus* is the presence of a number of tassels on the abdomen—two on the last segment but one, and four on the last segment (*g*). In the figure one of the tassels is shown as cut off. The head, thorax, and abdomen are red, with darker patches ; the thorax smooth, the abdomen cylindrical and segmented. On each segment are a few hairs, and each of the tassels bears several long setæ. The eyes are prominent, dark-brown, and conspicuously facetted. The wings are large, brown, with a strong red, bifurcated nervure, and two longitudinal whitish streaks or hyaline bands. The halteres are thick and inflated, with four seta-like hooks. Antennæ (*f* and *h*) long and rather stout, with ten joints, each of which is constricted in the middle, and may be easily mistaken for two. Each joint bears two rings of very long fine hairs. Feet (*i*) long and slender ; the trochanter has a long seta ; tibia more than twice the length of the tarsus ; upper digitules absent, lower pair fine hairs. There are no ocelli on the head.

This is a very interesting insect for several reasons, the first of which may be that, as far as my information extends, the females of *Monophlebus*, as noted above, have not yet been described. The males of seven species are given in Dr. Signoret's work, the descriptions being taken verbatim from Westwood's "Arcana Entomologiæ," 1841 ; and nobody else seems to have examined or described the genus. Of these seven one (*M. Illigeri*) is given as from "Van Diemen;" in size it nearly agrees with our insect, the male being about $\frac{1}{8}$ inch long, with $\frac{2}{5}$ inch expansion of wings ; but it [the male] is said to be "nigricans, pedibus nigris," and to have tassels on each abdominal segment. These old descriptions, especially in the absence of any notice of the females, are too vague for identification. Westwood assigns 22 joints to the antenna of the male *M. Illigeri*. He had evidently examined it only with a lens, and failed to see the constriction in each joint.

The female *M. Crawfordi* resembles very much in outward appearance the New Zealand insect *Cœlostoma Zealandicum*, and my friend Mr. Crawford sent it to me as of that genus. But the presence of a distinct rostrum, which can easily be seen although it is very small, quite removes it from *Cœlostoma ;* and I have pleasnre, whilst ascribing it to its proper genus, in connecting it with his name. Of proper habitat, it cannot well be said to have any, as it crawls about freely, though slowly. Probably, as stated above, the second female stage may be some day found to be stationary on some plant in waxy tests.

I should observe that, if the characters of Monophlebus hitherto given were correct, the insects above described, having only nine joints in the female antenna, could not be adult. But, in the first place, the whole appearance of the female, its free locomotion, its cottony envelope, its general form, all point clearly to its adult state. Secondly, and this is most important, the tibia is a great deal longer than the tarsus: and this, all through the Coccid family, with the exception of a very few genera, is only the case in the adult. I should be very much surprised if the female I have been describing ever turns out to be anything but full-grown.

PARASITES.

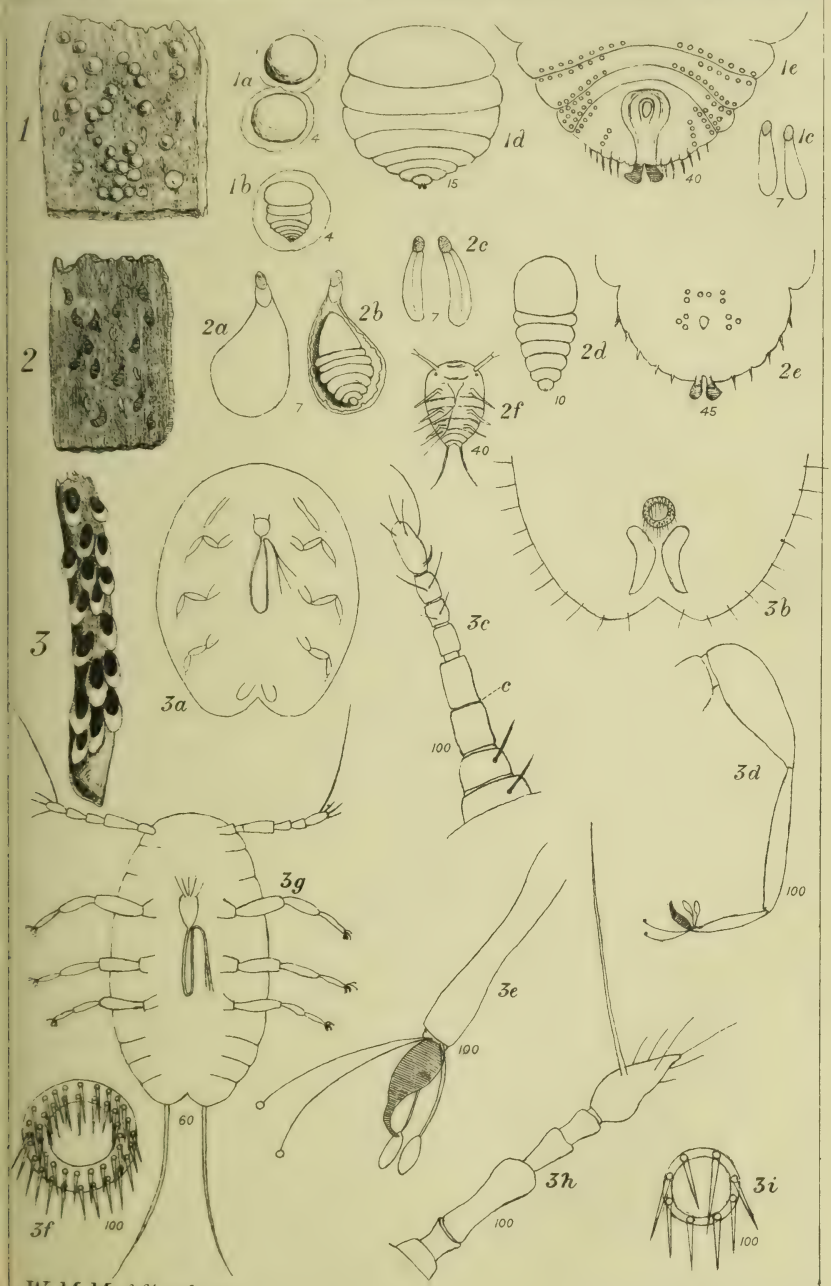
Coccids are greatly subject to attacks from parasitic enemies, chiefly Hymenoptera, sometimes Diptera. If it were not so, their ravages, which are quite bad enough as it is, would be entirely destructive; the parasites keep them very much in check. Amongst the insects described in this paper two clearly show parasites. I found five dead female *Aspid. eucalypti*, each containing the pupa-case of a hymenopterous parasite which had emerged and flown away; and Mr. Crawford has sent me four female *Monophlebus*, which are literally riddled like sieves with holes from which small dipterous flies have emerged. In New Zealand I have never yet found more than one parasite in a Coccid; these South Australian insects evidently can harbour many; I counted 69 holes in one *Monophlebus*. These flies appear to be of the same kind as that which Mr. Crawford has reported as killing *Icerya Purchasi*; but I am not sufficiently acquainted with the Diptera to identify them. The group Monophlebidæ (always excepting *Icerya*) are not, I think, injurious insects; and if they will breed numbers of parasitic flies which may also attack other and worse pests than they are, they might even be encouraged, if possible.

EXPLANATION OF PLATES XII. TO XIV.

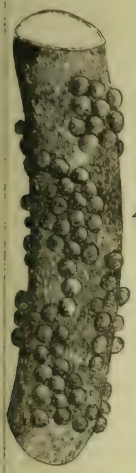
Plate XII.

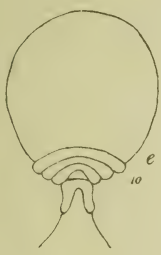
Fig. 1. *Aspidiotus eucalypti*, sp. nov. Insects male and female in puparia on bark of eucalyptus; nat. size.
- *a*. Female puparia, upper side.
- *b*. Female puparium, underside with female.
- *c*. Male puparia, upper side.
- *d*. Adult female.
- *e*. Abdomen and pygidium of female with spinnerets.

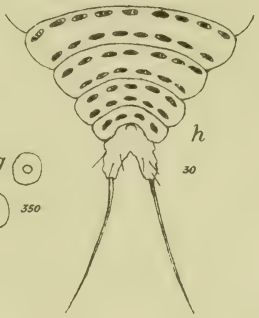
Fig. 2. *Chionaspis assimilis*, sp. nov. Insects male and female in puparia on bark of eucalyptus; nat. size.
- *a*. Female puparium, upper side.
- *b*. Female, under side with female.
- *c*. Male puparia, upper side showing carination.
- *d*. Adult female.
- *e*. Abdomen and pygidium of do. with spinneret groups.
- *f*. Larva underside, showing rostrum.

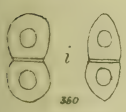


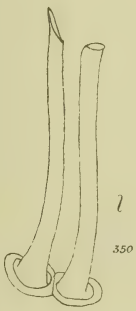
SURVEYOR GENERAL'S OFFICE, ADELAIDE. Frazer S. Crawford. Photo-lithographer.

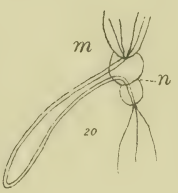


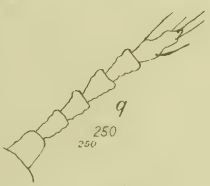


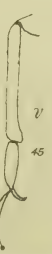


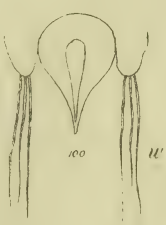












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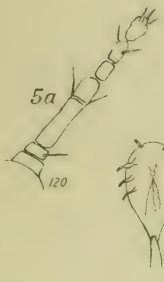
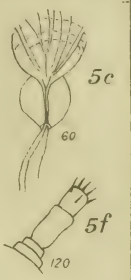
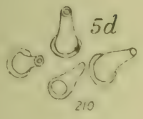
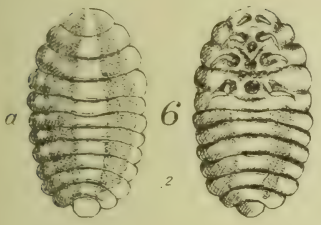
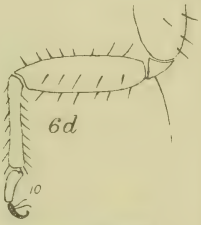
SURVEYOR GENERAL'S OFFICE, ADELAIDE. *Frazer S. Crawford, Photo-lithographer.*

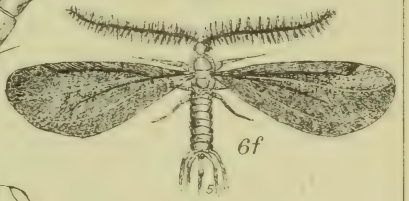


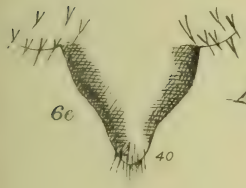


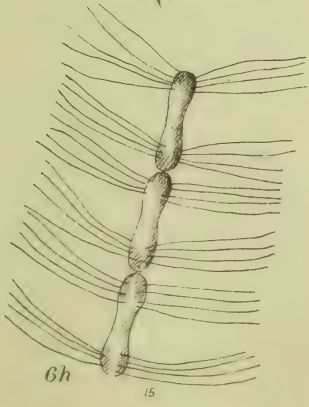


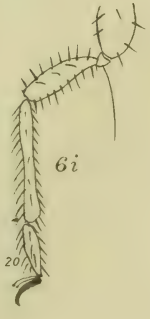












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SURVEYOR GENERAL'S OFFICE, ADELAIDE. Frizer S. Crawford, Photo-lithographer

Fig. 3. *Fulvinaria flavicans*, sp. nov. Females with cottony secretion on twig (shrub undetermined) ; nat. size.
a. Diagram of adult female.
b. Diagram of abdominal cleft and dorsal lobes of ditto.
c. Antenna of ditto, showing doubtful joint at *c*.
d. Foot of ditto.
e. Claw and digitules of ditto.
f. Anogenital ring of ditto.
g. Larva.
h. Antenna of ditto.
i. Anogenital ring of ditto.

Plate XIII.

Fig. 4. *Eriococcus paradoxus*, sp. nov. Insects male and female, in sacs on twig of Pittosporum ; nat. size.
a. Sacs of female, upper side, showing orifice.
b. Vertical section of aggregated mass of sacs, with insects.
c. Sac of male.
d. Ditto, showing orifice of escape.
e. Adult female.
f. Ditto, diagram to show stigmatic spinnerets.
g. Stigmatic spinnerets.
h. Abdomen of female, showing tubercles and spinneret-bands.
i. Abdominal spinnerets.
k, *l*. Threads from ditto.
m. Rostrum.
n. Mentum with setæ.
o. Antenna of female.
p. Larva ; dorsal view ; diagram to shows spinnerets.
q. Antenna of ditto.
r. Spinneret of ditto.
s. Adult male.
t. Antenna of ditto.
v. Foot of male.
w. Abdominal spike and setæ of ditto.

Plate XIV.

Fig. 5. *Ripersia leptospermi*, sp. nov. Diagram of adult female after maceration and pressure ; enlarged twelve diameters.
a. Antenna of ditto.
b. Foot of ditto.
c. Rostrum of ditto.
d. Spinnerets of ditto.
e. Larva.
f. Antenna of ditto.

Fig. 6. *Monophlebus Crawfordi*, sp. nov.
a. Adult female, dorsal side, enlarged two diameters.
b. Ditto, under side showing rostrum, enlarged two diameters.
c. Antenna and eye of female.
d. Foot of female.
e. Rostrum of ditto.
f. Adult male.
g. Abdomen of male, showing tassels (one cut off).
h. Three joints of antenna of ditto.
i. Foot of male.

Note.—Mr. Maskell's drawings being in colours, the plates are photo-lithograph copies of them made by Mr. F. S. Crawford.

On Measuring the Power of Telescopic Eyepieces.

By D. B. Adamson.

[Read February 1st, 1887.]

In the course of my telescopic observations I have made a point of inquiring of parties, when they have been observing the moon, what they considered the apparent diameter of that luminary to be when viewed with the naked eye. I have found the variety of opinions on this subject to be very surprising.

One old gentleman informed me that to him the moon appears to be rather over six feet in diameter; while another friend says it looks the size of a dinner-plate; and another tells me it seems about the size of a saucer; while another gives the size of an onion as the moon's apparent diameter. Now these different answers, although so various, might each and all of them be correct, as the apparent magnitude of any object depends entirely on the distance at which that object is viewed; so that if a six-feet rod or the dinner-plate, the saucer, or the onion, were placed between the moon and the eye of the observer, and each at such a distance that it would exactly cover that luminary from view, then their apparent magnitudes would, of course, be equal. But for this purpose those articles would require to be placed at such a distance from the observer that they could not be distinctly seen by the unassisted eye.

When a person of normal eyesight wishes to examine any small object minutely he holds it at a distance of about eight inches from his eye, and we find, if we hold a threepenny-piece at this distance, it far more than covers the whole of the moon's disc, and I find when I hold the blade of my penknife at this distance, it quite eclipses the moon. Now the width of that blade is not six feet, but only about three-sixteenths of an inch.

In showing persons the heavenly bodies in a telescope, they are very often sceptical about the magnifying powers, and when they are informed that the power they are using gives, say, one hundred diameters, they will say, "Certainly the object is exceedingly sharp and distinct, and seems so near that you feel as if you could put your finger on it. But surely it is not magnified so much?"

To convince anyone of the magnifying power, if the instrument be a "refractor," we have only to tell him to look into the tele-

scope with one eye, and compare the moon as seen there with the same object as seen with the other and unassisted eye, and he will very soon be convinced, for with a little manipulation the moon, as seen by the naked eye, may be brought over the magnified image as seen in the telescope, when it will be found that the former appears so small that it might be put into one of the craters of the latter.

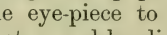
To perform the same experiment with my "Newtonian Reflector," I have constructed a small metallic speculum, which can be slipped on to the eye-piece tube, and can be turned to any required angle, so that the object as seen by the naked eye can be brought over the magnified image in the telescope. When the instrument with a power of 108 is turned on the Post-office clock we find that the whole diameter of the tower as seen in the plane reflector occupies only about the space of one of the minutes marked on the circumference of the dial as seen in the telescope. By methods such as these we can convince the most sceptical that telescopes do magnify, but for those who use telescopes for scientific observation it is absolutely necessary that they should know the magnifying powers of their instruments with the greatest possible precision. For this purpose several methods may and have been adopted. As the magnifying power of any telescope depends entirely on the magnitude of the angle under which any object is presented to the eye in the eye-piece of the instrument, and as this angle can at once be found by dividing the focal length of the object glass or the speculum by that of the eye-piece employed, this might seem a very simple way of getting at the exact power; and indeed it is fairly satisfactory as far as low powers are concerned, or with single-lens eye-pieces, but when we come to use eye-pieces composed of several lenses the matter becomes more difficult, and when we come to use those of a very high power the exact determination of the focal length of each lens becomes a matter of exceeding difficulty, and the result of such measurements cannot be relied on.

Another method, and one a good deal more to be depended on, is to have a circular disc of white paper on a black ground at a distance of 100 yards or so, and having a card with two black parallel lines drawn on it whose distance is exactly equal to the diameter of the paper circle, then viewing through the telescope the paper circle with one eye and the parallel lines on the card with the other let the lines be moved to such a distance from the eye that they shall exactly correspond with the diameter of the disc. The quotient found by dividing the distance of the paper disc from the eye by that of the parallel lines from the same gives the magnifying power of the telescope. This method, though good, requires some practice, and is only applicable to refractors

up to a certain size, and could not be used at all with Newtonian reflectors.

Another and much more convenient method consists in measuring the image of the object glass or speculum which a telescope forms in its solar focus. When we place our eye at a little distance from the eye-piece of a telescope we observe in the centre of the eye-lens a very distinct and well defined small disc of light. This is the image of the object glass or the speculum, as the case may be. Now if we can obtain a correct measure of the diameter of this disc, and also of the diameter of the speculum, by dividing the latter by the former, we have at once the number of diameters which the telescope magnifies.

For the purpose of accurately measuring this small disc of light as seen on the eye-lens, several kinds of "dynameters," or as some prefer to call them, "dynamometers," have been used. One of the latest, and perhaps the best, is that known as "Berthon's dynamometer." This consists of two strips of thin metal with straight edges so fastened together as to leave between them a long narrow triangular slit, one of the edges of which is so graduated and numbered that measures may be made with it down to one-thousandth of an inch.

While it is admitted that this measuring of the small disc is a very simple and direct method of obtaining the magnifying power, there are still several difficulties attending its application. For example, a very small disc of light is not the easiest thing to measure, besides it is not possible to measure a circular disc on its exact diameter by placing it between two lines which are not quite parallel, and Mr. Berthon has devised a very simple and efficient means by which these difficulties may be obviated, and here I would give Mr. Berthon's own description:—"Take or make a box twenty inches long and about six inches in its other dimensions, entirely open at one side. Make a hole in one end, and set it upon the other. Provide a card to fit the lower end inside; to the middle of this card attach a narrow slip of black paper (the border of mourning note paper will do), say four inches long. Then place the eye-piece to be measured in the hole, and use my V-dynamometer, and by dividing four inches by the ascertained length of the image of the black line, you have the power of the eye-piece on a focal length of twenty inches, whence its power on any other number of inches may be ascertained by simple arithmetic. Let the black slip or mark be pointed at each end, thus  and it is surprising how exactly its image can be measured, even to the five-thousandth of an inch. It is well to have three or four cards with lines of various but exactly measured lengths, say two, three, four, &c.,

inches, and always to use the longest that the eye-hole will admit of."

I may say that to facilitate calculations I have made my box twenty-one inches in length, being just the sixth part of the focal length of my speculum, which is ten feet six inches.

I may also mention one or two things that should be observed in making use of this apparatus. In the first place the dynamometer should be laid as close on the eye-glass as possible, otherwise we cannot be certain that our measure is correct. Also we must measure our distance not from the card to the eye-lens, but should the eye-piece be a Huyghenian or negative eye-piece we must measure from the card to the diaphragm half way between the field-lens and the eye-lens, for this diaphragm is or ought to be at the exact focal distance of the instrument and where the image is formed. Should the eye-piece be a "Ramsden," or a positive eye-piece of any kind, of course the measure must be taken from the card to the point where the image is formed, just in front of the field-lens. These precautions being attended to a very exact measure of the magnifying power of any telescope may be obtained.

I might remark in conclusion that very many persons have an idea that in using a telescope, and especially if it be a refractor, that they are looking through the instrument, but the truth of the matter is that we cannot see through any telescope whether it be a refractor or a reflector, and we see not the object itself, but only a magnified image of that object, which image is formed in the focus of the eye-lens.

The Gastropods of the Older Tertiary of Australia. (Part II.)

By Professor Ralph Tate, F.G.S., F.L.S.

[Read October 2nd, 1888.]

Plates II.–X.

[SUPPLEMENT TO PART I.]

Fusus henicus, *spec. nov.* Plate vi., fig. 11.

Shell fusiform, with a short spire, ending in a turbinate pullus of one and a half smooth convex whorls.

Whorls, three, excluding the apical one, rather sharply keeled in the one-fourth, obliquely plicated; the plicæ (ten to a whorl) forming blunt wedge-shaped tubercles on the keel.

Surface ornamented with stout subangulated liræ, about seven on the last whorl posterior to the periphery, with occasionally a slender thread in the broader intervening sulci, and by coarse subdistant curvilinear growth-lines.

The last whorl abruptly contracted in a long straight, slender, open beak; base with numerous wrinkled liræ, the interspaces coarsely cancellated.

Dimensions.—Length, 25; breadth, 11·5; length of canal and aperture, 18.

Locality.—Lower beds at Muddy Creek (*J. Dennant*).

This species comes near to *F. Aldingensis*, from which it differs by its turbinate pullus, coarser ornament, blunt nodulations, and by the angulation of the whorls being closer to the anterior suture. It has also much resemblance to the young of *Tudicula turbinata*.

Fusus Gippslandicus, *Tate.* Figured herewith, Plate iii., fig. 6.

Fasciolaria fusilla, *spec. nov.* Plate vi., fig. 12.

Shell ovately fusiform, with a moderately long spire, ending in a prominent bead-like pullus with the apex laterally immersed. Whorls, four, excluding the pullus, flatly convex, spirally lirate, and distantly transversely lined; liræ slender, more or less alternately large and small, about 18 on the penultimate whorl, a little narrower than the intervening sulci.

Last whorl regularly rounded to the gradually contracting base, spirally lirate; columella slightly arcuate with three

strong oblique plaits, the anterior one of which at the junction with the snout, is the largest, and is somewhat decurrent on the relatively short, slightly bent, and open canal.

Dimensions.—Length, 42; breadth, 17; length of aperture and canal, 28.

Locality.—Lower beds at Muddy Creek (*J. Dennant*).

This species differs from all those previously described by its rounded whorls without costæ or tubercles, and has no analogue among recent forms.

Peristernia Murrayana, *Tate.* Figured herewith, Plate iv., fig. 4.

Peristernia pumila, *spec. nov.* Plate viii., fig. 4.

Shell fusiform, with a short subscalar spire, ending in a small mamillate apex of one and a half smooth convex whorls.

Whorls four (excluding apical one), a little flattened in front of the suture, with nine stout plications to each whorl; plicæ narrowly rounded, high, elevated into blunt tuberculations at the shoulder. Surface smooth, shining, ornamented with a few distant incised spiral lines.

Last whorl flatly rounded in the middle, where the plicæ fade away, thence abruptly contracted into a very short straight beak. Aperture oval-oblong; outer lip thin, smooth within; columella with three strong oblique folds; canal very short, open, straight, a little reverted at the tip.

Dimensions.—Length, 4·75; breadth, 2·25; length of aperture and canal, 2.

Locality.—Clayey green sands, Adelaide bore.

By its very short canal this species bears a general resemblance to *P. apicilirata* and *P. actinostephes*, from which it differs in its smooth pullus and tabulate whorls.

Eburnopsis, *gen. nov.*

It is with some diffidence that I establish a new genus for the reception of the following species, which has the general aspect of *Eburna;* but unlike all known species of that genus, it is spirally ribbed and wants the callous structure of the inner lip and umbilical region; moreover, the truncated columella, with its subtuberculated extremity, is unknown in *Eburna*. The generic name indicates its affinity with *Eburna*.

Euburnopsis aulacœssa, *spec. nov.* Plate iv., fig. 3.

Shell ovately globose, spire very short, ending in a moderately large globose pullus.

Ordinary whorls three, narrow, deeply channelled at the suture, the shoulder sharp-edged and strongly defined. Ornamented with moderately elevated, rounded spiral ribs (six on the penultimate whorl), a little narrower than the somewhat concave

furrows; the whole surface strongly and closely wrinkled transversely. Last whorl regularly and moderately convex from the middle to the base, spirally ribbed and sulcated; umbilicus narrow, defined by a rib a little broader than the rest of the ribs, which results from the successive infilling growths of the siphonal notch.

Aperture oval, channelled posteriorly, corresponding with the shoulder of the whorl; outer lip thin, crenulated on the edge, joined to the columella by a callous growth; columella slightly incurved, obliquely truncated and thickened at the front; siphonal notch shallow and narrow.

Dimensions.—Length, 14; breadth, 10; height of aperture, 10.

Locality.—Lower beds at Muddy Creek (*J. Dennant*).

Phos Gregsoni, *Tate.* Figured herewith, Plate iv., fig. 5.

Nassa sublirella, *Tate.* Figured herewith, Plate iv., fig. 2.

FAMILY VOLUTIDÆ.

Genus Lyria.

SYNOPSIS OF SPECIES.

Costæ, 20, terminating posteriorly in blunt points.
1. *L. harpularia.*

Costæ, 30, terminating posteriorly in small rounded tubercles.
2. *L. gemmata.*

Lyria harpularia, *Tate.*

Trans. Roy. Soc., S. Aust., 1888, t. 12, fig. 12, without description.

Shell fusiformly ovate, somewhat thin, transversely costate; costæ, about 20, on last whorl, narrow, subacute, slightly flexuous, terminating posteriorly in blunt points on the slightly flattened shoulder; interstices wider than the costæ, transversely and spirally striated. Spire subacute, of six slightly convex whorls terminating in a smooth pullus of one and a half whorls. Aperture elliptical-elongate, outer lip thin, united to the pillar by a thin callus; columella with two prominent anterior folds and numerous transverse rugosities; canal very short, recurved.

Dimensions.—Total length, 32; breadth, 17; length of aperture, 22; breadth, 8; height of last whorl, 26.

Localities.—Lower beds at Muddy Creek; blue clays at Schnapper Point.

Lyria gemmata, *spec. nov.* Plate iii., fig. 4.

Similar to *L. harpularia*, but usually narrower and less ventricose with about 30 slender, less flexuous, ribs on the last whorl,

which terminate posteriorly in small beadlike tubercles, and rendered more conspicuous by an ill-defined narrow encircling depression in front of the suture.

Dimensions.—Total length, 19; breadth, 9; length of aperture, 13.

Locality.—Upper beds at Muddy Creek (*J. Dennant*).

Genus Voluta.

SYNOPSIS OF SPECIES.

Nucleus spherical, disproportionately large, columella plaits 3 or 4.
- Outer lip expanded, wing-like; whorls tuberculated on the shoulder. 1. *V. Hannafordi.*
- Outer lip not expanded; whorls strongly costated.
  - Costæ, 7 on last whorl, roundly angled. 2. *V. heptagonalis.*
  - Costæ, 11 on last whorl, sharply angled. 3. *V. alticostata.*
  - Costæ, 14 on last whorl. 4. *V. Stephensi.*

Nucleus turbinated, crenulated; spire-whorls costated and bearing spinous scales at the shoulder; columella plaits, 4.
- Ribs on posterior whorls, about 20 pairs. 5. *V. McDonaldi.*
- Ribs on posterior whorls, about 9. 6. *V. uncifera.*

Nucleus papillary, smooth; outer lip winged.
- Spire nearly as long as aperture; nucleus small, with an erect tip. 7. *V. macroptera.*
- Spire nearly half length of aperture; nucleus large, blunt; whorls medially angulated. 8. *V. Mortoni.*

Nucleus papillary, smooth; outer lip not expanded.
- Shell sub-cylindrical; surface finely wrinkled spirally.
  - Last whorl with 14 inconspicuous transverse nodulations; suture concealed 9. *V. limbata.*
  - Last whorl with seven transverse tubercles; suture exposed. 10. *V. conoidea.*
- Shell oval-oblong to turriculate.
  - Surface of anterior whorls smooth, without tubercles.
    - Pullus mamillate, large, its apex laterally immersed. 11. *V. ancilloides.*
    - Pullus papillary, blunt; apex central.
      - Spire attenuate, whorls slightly convex, pullus small.
        - Posterior whorls smooth. 12. *V. McCoyii.*
        - Posterior whorls tuberculate. 13. *V. protorhysa.*
      - Spire short, whorls convex, pullus large. 14. *V. polita.*

Pullus subcylindrical, blunt; apex central.
Surface spirally striated or finely ridged, especially on posterior whorls.
15. *V. ellipsoidea*
Pullus acuminate, pointed at the end.
Spire half length of aperture; posterior whorls spirally lined. 16. *V. capitata.*
Spire less than one-third of the aperture, ornamented with transverse colour-lines.
17. *V. Masoni.*
Surface with spiral threads, at least on the posterior whorls.
Spiral lines on posterior whorls only; see 7, 11, 15, 16, 26.
Spiral ornament on all the spire whorls.
Outer lip varicosely thickened.
18. *V. crassilabrum.*
Faint longitudinal ridges on last whorl; pullus rather depressed.
19. *V. lintea.*
Whorls cancellated. 20. *V. cribrosa.*
Whorls costated; spire turreted.
21. *V. sarissa.*
Surface costulate or costate, without spiral ornament.
Costulæ not prominent; spire half the length of aperture. 22. *V. lirata.*
Costulæ conspicuous; spire about one-third length of aperture. 23. *V. costellifera.*
Costated; spire nearly as long as aperture.
24. *V. pseudolirata*
Surface tuberculated.
Spire elongated, at least one half the length of aperture; columella plaits, 4.
Last whorl tuberculated, but not costated.
Apex blunt; tubercles blunt, on anterior whorls only. 25. *V. cathedralis.*
Apex pointed; tubercles sharp on all the whorls; fine spiral striæ.
26. *V. pagodoides.*
Anterior of last whorl costated.
Tubercles blunt; aperture a little longer than spire. 27. *V. Tateana.*
Tubercles pointed; spire about the length of aperture. 28. *V. tabulata.*
Spire short, less than half the length of aperture.
A second row of tubercles at the suture; pullus small.

Costæ angular, ending in pointed tubercles. 29. *V. antiscalaris.*
Costæ rounded, with obtuse tubercular ends at the shoulder. 30. *V. anticingulata.*
Tubercles on shoulder of whorl only; pullus large.
Tubercles spinous; ante-sutural area concave. 31. *V. strophodon.*
Tubercles short, conical; whorls convex behind. 32. *V. Weldii.*

SPECIES UNCLASSIFIED.

V. Agnewi, *Johnston*, Proc. Roy. Soc. Tasmania for 1879, p. 37, non 1888; *V. antiscalaris*, Johnston, Geol. Tasmania, t. 30, f. 8, 1888. Table Cape.

V. Allporti, *Johnston*, op. cit. p. 35, 1880, non 1888. Table Cape.

V. pellita, *Johnston*, op. cit., p. 37, 1880; id. Geol. Tasm., t. 30, f. 2. Possibly *V. ancilloides* or *V. macroptera.* Table Cape.

V. stolida, *Johnston*, op. cit., p. 36, 1880; Geol. Tasmania, t. 30, figs. 4-4*a*. Related to *V. strophodon.* Table Cape.

1. Voluta Hannafordi, *McCoy.*

Reference.—Prodromus Pal. Victoria, Decade I., tab. vi., fig. 1, 1874; Decade IV., tab. 37, fig. 1.

Localities.—Older beds at Muddy Creek!; clays at Schnapper Point!; Port Fairy, Warrnambool; and at Fyan's Ford (*McCoy*).

This species is remarkable for its large pullus and winged outer-lip; the whorls are obtusely angled and nodosely-tuberculate; the posterior slope of the body whorl is spirally ridged or lined, the front is smooth.

Length, exceeding 150; breadth, 90; pullus, 12 in diameter.

The only other winged species are *V. macroptera*, McCoy, and *V. Mortoni*, Tate, which are smooth, or nearly so, with a small pullus.

2. Voluta heptagonalis, *spec. nov.* Plate iv., figs. 1 and 7.

Shell narrowly fusiform, with a moderately long scalar spire ending in a large spherical pullus of one and a half smooth whorls, the apex of which is laterally immersed; the pullus is partitioned off from the spire. Whorls, four, beside the pullus; the first one convex, spirally lined, and faintly plicate, at first very narrow, but enlarging and developing a shoulder and strong costæ on the next whorl; the two other spire-whorls angulated in the posterior-third, the area next to the suture being nearly flat or slightly

concave, the anterior portion nearly straight or parallel with the axis.

Surface ornamented with roundly angular axial ribs, which terminate in bluntly angled tubercles at the shoulder; shoulder broadly and deeply undulate between the tubercles. The ribs are seven in number on the body whorl, but increase to about eleven on the posterior whorls. The sculpture on the posterior spire-whorls consists of spiral lines crossed by transverse striæ; that on the body-whorl is not accurately known but is apparently limited to transverse lines of growth.

Body-whorl with the ribs strongly developed into thick conical tubercles at the shoulder, fading off to the front at about the middle; base gradually much attenuated. Aperture elongate-obovate; columella with three strong plications.

Dimensions.—Total length, 150; greatest breadth, 62; length of aperture, 95; greatest width, 28; diameter of pullus, 14; height, 13.

Locality.—Calciferous sandstone of the River Murray cliffs near Morgan.

3. Voluta alticostata, *spec. nov.* Plate v., fig. 7.

Shell resembling *V. heptagonalis*, but is proportionately shorter or broader. The ribs are sharply angled, eleven on the body-whorl, increasing to fourteen on the posterior whorls. The sculpture on the posterior whorls consists of crowded spiral lines rendered wavy by the crossing of striæ and growth lines; the same sculpturing is present on the posterior slope and shoulder of the body-whorl, but the rest of its surface is smooth; pullus and columella plaits as in *V. heptagonalis*. The pullus was hopelessly shattered by an accident before the execution of the drawing, but it revealed, in the unique specimen, a septum between it and the spire.

Dimensions.—Length, without pullus, 90; breadth, 49; length and breadth of aperture, 60 and 21.

Locality.—Lower beds at Muddy Creek (*J. Dennant*).

4. Voluta Stephensi, *Johnston.*

Reference.—Proc. Roy. Soc., Tasmania, for 1879, p. 35 (1880); id., Geology of Tasmania, t. 30, f. 1 (1888).

From an unpublished drawing furnished me by Mr. Johnston, this large species belongs to the same natural group as *V. heptagonalis* and *V. alticostata*, being intermediate in proportions between the two; it is further distinguished by having 14 ribs on the body whorl, increasing to 18 posteriorly, and by the absence or indistinctness of spiral sculpture.

Dimensions.—Length, 110; breadth, 55.

Locality.—Table Cape (*R. M. Johnston*).

The two following species may conveniently be included in the Section *Vespertilio*, though they present in their large turbinate pullus of several crenulated whorls a facies peculiarly their own.

5. Voluta MacDonaldi, *Tate*. Plate iii., fig. 5.

Reference.—Gastropods, Part I., plate xii., fig. 11 (1888).

Shell oval-oblong, with a rather short gradated spire ending in a subcylindrical pullus of four and a half narrow crenulated whorls, the terminal ones depressed.

Whorls three, excluding pullus; the two posterior whorls angulated in the posterior-third, the front parallel with the axis and costated, the posterior area concavely sloping upwards; the costæ terminate at the shoulder in high-vaulted spinous scales; on the first spire-whorl the spines are about 20 in number, and terminate each a pair of costæ.

The body whorl is somewhat ventricose, with a high shoulder, concavely sloping upwards to the suture; the angulation crowned with 16 spinous scales which terminate broad undulations, not ribs, rapidly becoming obsolete. Columella with four distant plaits; outer lip thin. The whole surface is sculptured with striæ and growth-lines; the only spiral-sculpture is confined to the last whorl of the pullus.

The pullus is not sharply separated from the ordinary spire-whorls, as there is a gradual change in the shape and ornament of the whorls; the actual junction being somewhat indicated by a slight eccentrictity of the first spire-whorls. Counting from the summit, the first and second whorls are smooth, flatly convex, with a deep suture, almost on a level, though the extreme tip is a little raised; the third whorl is convex, flatted, and strongly crenulated in front of the suture; the crenulations gradually elongate with the increasing angulation, so that the last is conspicuously angulated and costated, but not at all spinously produced; this last whorl is marked moreover with fine spiral ridges.

Dimensions.—Total length, 115; breadth, 67; length of aperture, 80; width, 130; height of pullus, 11; greatest width, 13·5.

Locality.—Lower beds at Muddy Creek (*H. McDonald*); blue clays at Schnapper Point (*R.T.*).

Until I received the very handsome specimen, herewith figured, from Mr. McDonald, of Hamilton, after whom I am pleased to name the species, I was acquainted with only two very young specimens collected by myself at Schnapper Point, one of which is figured in my Part I., as quoted above.

6. Voluta uncifera, *Tate.*

Reference.—Gastropods, Part I., plate xii., fig 10.

Two young examples only known, which exhibit the general character of equally sized specimens of *V. McDonaldi*, but the specific differences are—the whorls of the pullus are all convex and feebly tubercular ridged; the body whorl is more attenuated, and has only about nine spinous scales on the angulation which terminate less defined costæ.

Dimensions of an example of six and a half whorls, including the apical ones:—Length, 34; width, 20; length of aperture, 22; width of pullus, 10.

Locality.—Calciferous sandstone of the River Murray Cliffs, near Morgan (*R.T.*).

7. Voluta macroptera, *McCoy.*

Reference.—Proc. Pal. Victoria, Decade I., tab. viii., figs. 1—4 (1874).

This species is fusiform, attaining to a length of about 150 mills.; the spire is moderately elongate, and consists of flatly convex whorls terminated by a relatively small papillary pullus, the extreme tip of which is erect; the whorls are smooth, except the two posterior ones, which are spirally striated or lined. At the adult stage the outer lip becomes dilated into a very large thin-edged, triangular, flattened wing.

Localities.—Bird rock, Geelong (*McCoy; J. B. Wilson!*); calciferous sandstone of the River Murray Cliffs, near Morgan (*R. T.*); Table Cape (Hobart Mus. !).

8. Voluta Mortoni, *spec. nov.* Pl. ix., figs. 1 and 2.

Shell fusiform, with a short spire of subangular whorls terminating in a relatively large, smooth, blunt pullus, the top of which is laterally immersed.

Whorls three and a half, excluding the pullus, the first half turn of the spire almost concealed, thence the revolutions rapidly enlarge to the somewhat ventricose body-whorl. The outer lip of the body-whorl is dilated into a large, thin-edged, flattened wing; its outer margin broadly convex, its posterior margin slightly concave running up to the angulation of the penultimate whorl.

The two posterior whorls are microscopically striated between a few distant raised lines; otherwise the shell is marked only with fine lines of growth.

Columella with two plaits, almost concealed from view.

Dimensions of a nearly adult shell (fig. 1).—Total length, 65; breadth, 32; length of aperture, 44; diameter of pullus, 5.

Localities.—Lower beds at Muddy Creek (*J. Dennant*); Table Cape (Hobart Mus. !)

I know of only two specimens which I have figured. Fig. 1 represents a perfect shell just about to develop the wing; fig. 2 wants the pullus and the basal part of the body-whorl, the angular body-and spire-whorls of which are similar to those of the other specimen, and therefore I think it not unreasonable to view the two as individuals at different stages of growth of the same species.

This species is named in honour to Mr. Alexander Morton, of Hobart Museum.

V. Mortoni is evidently closely allied to *V. macroptera*, but it is distinguished from it by its shorter spire, different pullus, and angulated whorls.

9. Voluta limbata, *Tate.*

Reference.—Gastropods part I., plate xiii., fig. 8 (1888).

Shell oblong and sub-cylindrical, spirally and transversely striate; spire short, terminated by a rounded pullus; columella with four well-developed plaits, increasing in size from the base backwards. Sutures and spire-whorls concealed by the free horizontal foliaceous expansion of the posterior margin of the preceding whorls. Last whorl faintly angled at the periphery, which is also defined by about ten inconspicuous angular nodosites. The spire-whorls and posterior part of the last whorl sculptured with delicate wavy lamellæ crossed by transverse folds and striæ; the spiral ornament is the stronger, but on the anterior area of the body-whorl, the transverse lines and folds are alone conspicuous, as the spiral striæ are obsolete, or visible only by the aid of a magnifier.

Dimensions.—Length, 32·5; width, 15; length of aperture, 27·5.

Locality.—Blue clays at Schnapper Point (*R.T.*)

This species and the next belong to the Section *Voluto-conus*, uniquely represented by *V. coniformis* (Cox), inhabiting the north-west coast of Australia, from which they differ in the angulated periphery, more or less nodulose; and this species by the retroflexed posterior margin of the whorls.

10. Voluta conoidea, *Tate.*

Reference.—Gastropod's part I., plate xiii., fig. 9 (1888).

Shell coniform, with a short spire, ending in a moderately mamillate pullus of three and a half turns, the last half turn sometimes crenulated. The first and second spire-whorls almost wholly embraced; the penultimate whorl is broadly depressed near the middle line, and slightly varicose over the posterior suture; the last whorl is faintly angled at the periphery, which is also defined by seven transversely elongate nodosites, posterior to which is a slightly concavely depressed zone. Outer lip sharp, slightly inflected in the middle. Columella with four well-

developed plaits, and a small posterior one. Surface sculptured as in *V. limbata.*

Dimensions.—Length, 44 ; breadth 21 ; length of aperture, 35.

Locality.—Lower beds at Muddy Creek (*R.T.*)

11. Voluta ancilloides, *spec. nov.* Plate iii., fig. 7.

Shell fusiformly oval-oblong, with a moderately elevated spire of four slightly convex whorls ending in a rather large sub-globose pullus of one and a half turns, the extreme tip of which is sub-laterally immersed. Posterior whorls sculptured with spiral fine threads and striæ, and rather close-set slender striæ of growth.

Body-whorl hardly narrowed at the base. Aperture narrowly oblong, narrowed above, broad at the front ; outer lip nearly parallel with the axis, slightly thickened ; pillar slightly incurved to the broad siphonal notch ; columella with three prominent, rather approximate, narrow, moderately oblique plaits.

Dimensions.—Length, 75; breadth, 28; length of aperture, 47; diameter of pullus, 8 ; height, 6.

Localities.—Calciferous sandstone, River Murray cliffs near Morgan (*R.T.*) ; lower beds at Muddy Creek (*R.T.*) ; blue clays at Schnapper Point (*R.T.*) ; Table Cape (*Hobart Mus.!*).

This species has the general appearance of the young *V. macroptera*, but the pullus is different, and the outer lip is not arcuate as in that shell.

12. Voluta McCoyii, *Tenison Woods.* Plate ii., fig. 2.

Reference.—Proc. Roy. Soc., Tasmania, for 1876, p. 95 (1877); *V. Agnewi*, Johnston, Geol., Tasm., t. 30, f. 9, 1888 (non 1880).

Shell lanceolate-ovate, thin ; whorls smooth, shining, striate with growth lines, slightly convex, but not regularly so, being slightly ventricose at the anterior suture and a little depressed towards the posterior one. Pullus small, blunt, smooth, papillary; the tip central, depressed, but not immersed. Columella plaits, four, thin, elevated, the posterior one small ; outer lip thin, but perceptibly thickened.

Dimensions.—Length, 40; breadth, 16; length of aperture, 25.

Localities.—Table Cape (*T. Woods*), common in the lower beds at Muddy Creek and in the blue clays at Schnapper Point (*R. T.*).

13. Voluta protorhysa, *spec. nov.* Plate ii., figs. 6*a*—*b*.

Shell narrowly lanceolate-ovate, thin, with a small, low, depressed, blunt pullus. Whorls six and a half excluding pullus; the three and a half posterior ones longitudinally costated ; the costæ on the first one and a half turns are slender, angular, and numerous ; on the next turn they are stouter, few, and tuberculately enlarged in the posterior-third ; and on the last half-turn

they finally fade away. The anterior whorls are flatly convex, smooth, but with striæ of growth.

Outer lip thin, columella with four oblique, thin, high plaits.

Dimensions.—Length, 39; breadth, 13; length of aperture 22.

Locality.—Clayey green sands, Adelaide bore.

This species has much affinity with *V. McCoyii*, but apart from the ornate apical whorls, it is distinguished by its narrower outline and flatter whorls.

14. Voluta polita, *spec. nov.* Plate ii., fig. 7.

Shell similar to *V. McCoyii*, smooth and highly polished, but it is proportionately broader, the whorls more convex, and the pullus is larger, though similar. The columella plaits are five, lamellar, very high, somewhat expanded, incrassated, and reflexed outwardly.

Dimensions.—Length, 29; breadth, 13·5; length of aperture, 19·5.

Locality.—Lower beds at Muddy Creek.

15. Voluta ellipsoidea, *Tate.*

Reference.—Gastropods, Part I., plate xiii., fig. 4. [Present description has reference to a larger and perfect specimen, which has been subsequently acquired.]

Shell narrow, fusiformly oval; spire elongate, pullus subcylindrical of three and a half smooth ivory-white whorls, separated by a deeply impressed suture; the tip is central, hardly rising above the level of the succeeding turn.

Whorls four, the first one much narrower than the preceding whorl, flat, the rest of the spire whorls very slightly convex, finely sculptured with spiral and transverse striæ.

Last whorl elongate and very little tumid, hardly attenuated at the base. Aperture narrowly oblong, roundly angled behind with a wide open canal, a little bent to the right and reverted at the front. Outer lip sharp, a little insinuate at the suture, nearly parallel to the axis, slightly incurved medially, patulous at the point. Inner lip slightly convex medially, a little twisted and bent back in front, with four stout distant oblique plaits.

Dimensions.—Length, 62; width, 23; length of aperture, 42; width, 7; height of pullus, 6; breadth, 6.

Locality.—Lower beds at Muddy Creek.

16. Voluta capitata, *spec. nov.* Plate ii., figs. 3*a*—*b*.

Shell fusiform-oval, thick, with a moderately long acuminate spire, ending in a smooth conic pullus of five turns, middle whorls of pullus much wider than the rest, the last whorl much narrowed, suture impressed; first two whorls channelled at the suture with an acute shoulder, the tip is exsert.

Whorls three, excluding the pullus, slightly convex and a little tumid medially; spirally lined and transversely striate, conspicuously so on the posterior whorl.

Last whorl elongated, a little tumid, hardly attenuated at the base. Aperture elongate-oval, angled behind, with a wide open canal a little bent to the right, and slightly reverted at the front. Outer lip thick within, but bevelled to a sharp edge, a little insinuated and slightly ascending at the suture, slightly ecurved medially, patulous at the point. Inner lip nearly straight, with four stout oblique plaits.

Dimensions.—Length, 61·5; breadth, 24; length of aperture, 43; width, 10; length of pullus, 6; width, 4·5.

Locality.—Well-sinking, Murray Desert.

This species has some affinity with *V. Pacifica* and other members of the section Alcithoe; but has not the outer lip proper to them; from *V. Pacifica*, which it resembles most in shape, it differs by its smooth flattish whorls.

17. Voluta Masoni, *spec. nov.* Plate iii., fig. 9.

Shell obconic, solid, smooth, polished; whitish, with transverse close-set, narrow, slightly undulose, chestnut lines. Last whorl roundly angled at the periphery; spire very short, acuminately conical, ending in a small, smooth, broadly conical pullus of four whorls. Columella with four well-developed plaits, and sometimes with an inconspicuous posterior one.

Dimensions.—Length, 58; width, 29; length of last whorl, 51; of aperture, 49.

Locality.—Upper beds at Muddy Creek.

This species belongs to the peculiarly Australian Section *Amoria*, amongst which it resembles *V. Turneri* and *V. undulata*, having the shape rather of the latter, and the coloration of the former; it is, however, distinguished from both by the abrupt peripheral inflation and the acuminate spire.

By the kindness of Mr. S. Mason, the proprietor of the land on which the chief fossiliferous deposits of Muddy Creek are found, I am in possession of the interesting volute which has served for the foregoing description. It is with much pleasure I associate Mr. Mason's name with his discovery, more particularly also because of his hospitality and assistance rendered to all visitors in search of fossils.

18. Voluta crassilabrum, *spec. nov.* Plate iii., fig. 2*a*—*c*.

Shell small, thick, oval; pullus small, of two smooth convex whorls.

Whorls three, excluding pullus, slightly convex excepting the penultimate, which is somewhat tumid; suture concealed by a narrow sutural band. Surface ornamented with close-set, narrow,

depressed, wavy threads, separated by linear interspaces (about 25 on penultimate whorl); a few indistinct undulations cross the whorls. Last whorl very slightly convex, a little attenuated and concavely depressed at the base, varicosely thickened behind the aperture. Aperture elongate-oval, narrowed at the ends; canal narrow, open, a little bent to the left and upturned at the front. Outer lip ascending a little at the suture, slightly arcuate, the edge blunt. Columella a little twisted at the front with four stout, oblique plaits, the second being the stoutest and the two posterior ones the smallest.

Dimensions.—Total length, 9; breadth, 4; length of aperture, 6.

Locality.—Lower beds at Muddy Creek.

19. Voluta lintea, *spec. nov.* Plate iii., figs. 1*a*—*b*.

Shell fusiform, narrow, thick; pullus of two and a half whorls, blunt and smooth at the top, the last half turn with slender costæ.

Whorls three and a half, rather flat, faintly depressed medially, with an impressed suture. Surface ornamented with numerous slender, wavy threads, a little narrower than the interspaces. Last whorl slightly convex, gradually attenuated to the moderately long straight canal; the posterior half with about eight angular ridges, which are faintly traceable from the suture to the base, but are more conspicuous at the periphery. Aperture elongate-oval; columella with four equi-distant and nearly equal plaits.

Dimensions.—Length, 26; breadth, 10·5; length of aperture, 17.

Locality.—Calciferous sandstones of the River Murray Cliffs, near Morgan.

20. Voluta cribrosa, *spec. nov.* Plate iii., fig. 8.

Shell fusiform, with a moderately long spire; pullus conical of two and a half whorls, ending in an erect tip; last half turn narrow, flat, but slightly angulated and flattened at the suture.

Whorls, three, slightly convex, more depressed behind than in front; ornamented with acute spiral threads (about 15 on the penultimate whorl), slightly crenulated, the interspaces about four times wider, crossed by curved, distant, slender, angular liræ. Columella with equal and equi-distant plaits.

Dimensions.—Length, 34; length of aperture, 20.

Locality.—Turritella-clays, Blanche Point, Aldinga Bay.

21. Voluta sarissa, *spec. nov.* Plate ii., figs. 1*a*—*b*.

Shell fusiformly turreted, moderately stout; pullus of three and a half to four whorls, conoidal-cylindric, smooth, the middle whorl the highest and widest, the tip is exsert.

Whorls six (excluding the pullus), flatly convex, ornamented

with spiral threads and angular costæ. The three posterior whorls are a little concavely depressed in the posterior-third; the rounded spiral threads (about twelve on the first whorl), which are about as wide as the interspaces, increase in number with the revolution of the spire. On the fourth and fifth whorls, adjacent to the anterior suture, the threads are reduced to striæ; and on the body-whorl the anterior half is smooth, or nearly so.

The costæ begin to appear on the front half of the second posterior-whorl, and on the three anterior whorls have attained to stoutish, wedge-shaped, slightly curved angular ridges, which are continued in subdued strength to the anterior suture, but do not reach the posterior one.

Last whorl with about nine transversely elongate costæ on the periphery, not much attenuated to the broadish open canal which is bent to the right and slightly reverted. Aperture elongate-oval, narrow; the outer lip straight medially (the last whorl being flattened between the anterior tubercle and the lip), hardly ascending but slightly insinuate at the suture, patulous at the front. Columella nearly straight to the slightly incurved tip; with five equi-distant plaits, the first and fifth of which are smaller than the others.

Dimensions.—Length, 77; breadth, 22; length of aperture, 49.

Localities.—Calciferous sandstone, River Murray cliffs, near Morgan; lower beds at Muddy Creek.

22. Voluta lirata, *Johnston.* Plate ii., fig. 4.

Reference.—Proc. Roy. Soc., Tasmania, for 1879, p. 37, 1880; *V. Allporti*, Johnston, Geol. Tasm., t. 30, fig. 10 (1888), non 1880.

Shell ovately fusiform, rather thin, smooth, shining. Pullus broadly conical, of four smooth, flattish whorls, with an impressed suture.

Whorls three and a half, excluding pullus, moderately convex at the anterior-third; ornamented with curved, slender, rather angular costæ, crowded on the posterior whorl; and sculptured transversely with very fine lines of growth.

Last whorl a little ventricose at the periphery (where the costulæ are only conspicuous), gradually tapering to the broadish front. Aperture elongate-oval, much longer than the spire; outer lip bevelled to a thin edge, a little emarginate and ascending at the suture, almost straight medially, patulous at the front; canal short, open, turned to the right, hardly reverted; columella arcuate towards the front, with four equi-distant, equal, oblique plaits.

Dimensions of largest example:—Length, 69; breadth, 27; length of aperture, 50; height of pullus, 5; breadth, 5·5.

Localities.—Table Cape (*R. M. Johnston*); lower beds at Muddy Creek.

Authentic specimens of this species I have not seen, but the shell which I have figured under the name agrees with the diagnosis and dimensions given of the type.

23. Voluta costellifera, *spec. nov.* Plate ii., fig. 8.

This species differs from *V. lirata* by its shorter spire, more ventricose body whorl, and stronger ribs.

Dimensions.—Length, 61; breadth, 29; length of aperture, 47.

Locality.—Lower beds at Muddy Creek.

24. Voluta pseudo-lirata, *Tate.*

Reference.—Gastropods, Part I., plate xiii., fig. 6.

Shell fusiformly cylindrical, rather thin. Pullus dome-shaped of two smooth whorls.

Whorls five, excluding the pullus, slightly convex or subangulated medially; posterior whorl ornamented with slender, angular, crowded costæ, which become fewer and stouter with the increasing revolution of the spire, there being 14 on the last whorl.

Last whorl hardly tapering to the broadish front; aperture elliptical, not much longer than the spire; outer lip thin, slightly curved medially, patulous at the front; canal short, broad, open, a little bent to the right and reverted. Columella nearly straight, with four oblique plaits, the anterior one the smallest.

Dimensions.—Length, 62; breadth, 19; length of aperture, 35; diameter of pullus, 5.

Localities.—Lower beds at Muddy Creek; blue clays at Schnapper Point.

This species has the general character of *V. lirata*, but differs in shape and in the well-developed costæ; being somewhat intermediate between that species and *V. sarissa.*, though differing from the latter by its pullus and the absence of spiral sculpture.

25. Voluta cathedralis, *Tate.*

Reference.—Gastropods, Part I., plate xiii., fig. 10.

Shell fusiformly cylindrical; pullus dome-shaped of two and a half smooth whorls. Whorls four and a half, excluding the pullus; the two posterior whorls nearly flat, spirally lined; the rest of the whorls very slightly convex and tuberculated in the middle line, the posterior slope spirally lined, the anterior slope smooth; there are about 10 small transverse wedge-shaped tubercles on the penultimate whorl.

Last whorl narrow-oblong, tubercles about seven, the last one-third plain; transversely striated all over and spirally striated next to the suture. Aperture elliptical; outer lip thin, nearly

straight medially, thence slightly expanding to the hardly contracted broad, short, open canal. Columella nearly straight, with four oblique slender plaits, the anterior one of which is the smallest.

Dimensions.—Length, 46·5 ; breadth, 14 ; aperture, 25·5.

Locality.—Lower beds at Muddy Creek.

This species is closely related to *V. pseudo-lirata*, but is distinguished by the spiral sculpture and the reduction of the costæ to tubercles.

26. Voluta pagodoides, *Tate.*

Reference.—Gastropods, part I., plate xiii., fig. 7.

Has the general form of *V. cathedralis*, but all the whorls, six, except the pullus, are medially sub-angulated and spinosely tuberculated on the keel ; the apex is sub-acute of one and a half small, narrow-rounded whorls. The sculpture consists of fine, spiral, wavy striæ, which are somewhat obsolete on the middle of the last whorl. Body-whorl more attenuated towards the base, which is bent and reverted. Columella with four sub-equal, equidistant, rather slender plaits.

Dimensions.—Length, 51 ; breadth, 16 ; length of aperture, 28.

Localities.—Turritella-clays, Blanche Point, Aldinga ; clayey-green-sands, Adelaide bore ; Turritella-grits, Ardrossan.

27. Voluta Tateana, *Johnston.* Plate ii , fig. 5.

Reference.—Proc. Royal Society Tasmania for 1879, p. 37 (1880) ; id. Geology Tasmania, t. 30, figs 3—3a.

Shell broadly lanceolate, fusiform, with a moderate high acute spire, ending in a small sharp pullus of two smooth turns. Whorls six, with regular sigmoid ribs which become somewhat obsolete towards the posterior suture, and towards the base of the body-whorl, but are raised into distinctly angled tubercles on the anterior-third of the whorl (12 on the last whorl) ; outer lip simple ; columella nearly straight, with four stout oblique plaits.

Dimensions.—Length, 70 ; breadth, 20 ; length of aperture, 40.

Locality.—Table Cape (*R. M. Johnston !*).

This species closely resembles *V. Kreuslerre*, Angas, of South Australian waters, but the spire is more acute.

28. Voluta tabulata, *Tate.*

Reference.—Gastropods, Part I., plate xiii., fig. 3.

Shell fusiform, with a rather short spire, ending in a moderately large pullus of two and a half whorls, the last half whorl costulate.

Whorls three and a half to four, excluding pullus, angulated ante-medially, costated in front of the keel, and sharply tuber-

culated on the angulation. The sculpture consists only of fine growth lines.

Last whorl with ten curved, angular, or broadly angular ribs, which are raised into sharp pointed tubercles on the keel; costæ becoming obsolete towards the base; base somewhat narrowly and abruptly contracted behind the very broad, short canal. Outer lip with a blunt margin, slightly emarginate behind, and ascending to the keel of the penultimate whorl. Columella nearly straight medially, ecurved at the extremity with four stoutish, equi-distant plaits.

Dimensions.—Length, 36; breadth, 17; length ot aperture, 26; diameter of pullus, 2·5.

Locality.—Well-sinking, Murray Desert.

29. Voluta antiscalaris, *McCoy.*

Reference.—Prod. Pal. of Victoria, Dec. 1, tab. 6, fig. 5, 1874.

Shell ovately fusiform, with a short or moderately long spire; pullus small, swollen of one and a half turns.

Spire whorls angularly convex, with a row of tubercles in front of suture and a second on the angulation; the latter terminate angular ribs; the two rows are separated by a rather wide concave space.

Last whorl with a variable number, about 15, of angular, slightly sigmoid ribs, extending less than half way to the base, each ending in a sharp conical tubercle on the angulation; there is a second smaller row at the suture, separated by a concave space.

Outer lip thickened at the edge and crenulated towards the front. Columella with about five plaits, the first and fifth small; sometimes a sixth plait is interposed.

The species shows some variation in the length of the spire; the short-spired variety has a more ventricose body-whorl; also in the spiral sculpture, being in some individuals obsolete, except at the base of the body-whorl.

Dimensions of a moderate-sized specimen.—Length, 39; breadth, 18·5; length of aperture, 29.

Localities.—Fyans Ford; Schnapper Point! (*McCoy*); lower beds at Muddy Creek; calciferous sandstones, River Murray cliffs.

This species closely resembles *V. scalaris*, Sow., from the Middle Eocene of Hampshire, but is especially distinguished by its obtuse, not acute, pullus.

30. Voluta anti-cingulata, *McCoy.*

Reference.—Prod. Pal. of Victoria; Dec. 1, tab. 6, figs. 2-4.

Synonym:—*V. antiscalaris*, Johnston, Geol. Tasmania, t. 30, figs. 5-5*b*.

This species has the general character of *V. antiscalaris*, with rather more ventricose whorls, the costæ end with obtuse tubercular ends separated from a row of conoidal tubercles at the suture by a deep, narrow, spiral constriction.

Dimensions.—Length, 50 ; breadth, 22 ; length of aperture, 39.

Localities.—Bird Rock (*McCoy*), and Spring Creek, near Geelong (*J. B. Wilson !*) ; well-sinking, Murray Desert ; Table Cape (*R. M. Johnston !*).

This species stands in the same relation to the European *V. cingulata* as *V. antiscalaris* does to *V. scalaris*.

31. Voluta strophodon, *McCoy*.

References.—Prod. Pal. Victoria, Decade iv., tab. 37, figs. 2-4 (1876). *V. Weldii* (pars.), Johnston, Geol. Tasm., t. 30, fig. 7 (1888).

Shell varying from ovate with a moderate spire to conoidal with a very short spire ; pullus large hemispheric to sub-cylindrical of four smooth slightly convex whorls. Ordinary whorls, with a row of spines crowning the shoulder, which is medial in the long-spired form, and at the suture in the conoidal variety ; the area behind the tubercles smooth and concave ; the spines on the body-whorl terminate ribs, which become obsolete at about half way to the front. Columella with four very large thick plaits, and often with a blunt protuberance posteriorly.

Dimensions of the long-spired form.—Length, 40 ; breadth, 20 ; length of aperture, 31 ; of the conoidal variety : length, 38 ; width inside spines, 23·5 ; length of aperture, 32·5.

Localities.—Fyans Ford, Moolap, Schnapper Point !, and lower beds at Muddy Creek ! (*McCoy*) ; calciferous sandstones, River Murray cliffs, near Morgan ! ; well-sinkings, Murray Desert ; Table Cape (*R. M. Johnston*).

If the extreme forms delineated by McCoy, figs. 2 and 4, *op. cit.*, belong to the same species, with which view I am inclined to concur, then *V. strophodon* is a more variable species than *V. antiscalaris*, both of which are exceptional in the genus. As pointed out by McCoy, the ordinary form of *V. strophodon* presents some resemblance to *V. spinosa*, Lamk. ; but the resemblance of the conoidal variety to *V. athleta*, Solander, is even greater. These two species of the European Eocene are readily distinguished by the small conical pullus and by the one or two prominent columella-folds succeeded by two or three indistinct ones.

32. Voluta Weldii, *Tenison Woods*.

Reference.—Proc. Roy. Soc., Tasmania, for 1875, p. 24, tab. 1, fig. 2 (1875) ; Johnston, Geol. Tasm., t. 30, figs. 6—6*b* (non 7), 1888.

This species is closely related to *V. strophodon*, but the whorls are convex, without costæ, with sharp-edged tubercles at the angle. Tenison Woods compares it to *V. depressa*, Lamk., from which it differs by the same characters which separate the Australian species from their European analogues.

Dimensions.—Length, 46 ; breadth, 22.

Localities.—Table Cape (Hobart Mus. !) ; lower beds at Muddy Creek ; River Murray Cliffs near Morgan.

Genus Mitra.

synopsis of species.

Shell mitriform, striate or spirally grooved. [Eu-Mitra.]
- Spirally grooved and punctured.
  - Spire elongated ; grooves, 6 ; plaits, 5. 1. *M. alokiza.*
  - Spire conically fusiform ; plaits, 4. 2. *M. Dennanti.*
- Finely longitudinally striate, and more or less reticulate.
  - Spire elongated, narrow ; 1 large, 2 small plaits. 3. *M. dictua.*
  - Shell broader ; 1 columella plait. 4. *M. uniplica.*
  - Fusiformly-conic ; body whorl varicosely thickened ; 4 plaits. 5. *M. varicosa.*

Shell somewhat columbelliform, smooth. [Strigatella.]
- Shell broad; outer lip crenate; 4 plaits. 6. *M. atypha.*
- Shell narrower ; outer lip smooth ; 4 plaits. 7. *M. complanata.*
- An ante-sutural rib ; outer lip lirate ; 5 plaits. 8. *M. ligata.*

Shell fusiform, spirally ridged and transversely striate. [Cancilla.]
- Aperture two-thirds the total length of shell, pullus small. 9. *M. othone.*
- Aperture nearly one-half; pullus large. 10. *M. atractoides.*

Shell fusiform, spirally and transversely ribbed ; aperture with a callosity at the posterior angle. [Zierliana.] 11. *M. escharoides.*

Shell fusiform, costated, abruptly contracted to a beak. [Costellaria.]
- Whorls convex or flat.
  - Spiral threads many. 12. *M. leptalea.*
  - Spiral ribs few, granulose ; spire somewhat scalar. 13. *M. euglypha.*
  - No spiral ornament. 14. *M. exilis.*

Whorls subangulated medially, without spiral ornament.
15. *M. paucicostata.*

Shell fusiform, costated, gradually attenuated to a beak.
Shell large, ribs curvèd ; an ante-sutural thread.
16. *M. terebræformis.*

Shell small, with clathrate ornament. 17. *M. clathurella.*

Shell fusiform, spirally ridged ; posterior whorls costate or plicate.
Whorls with slender plicæ.
Shell narrow, whorls regularly convex.
18. *M. biornata.*

Shell broader, whorls flatted and crenulate at suture.
19. *M. subcrenularis.*

Whorls with stout subtuberculose costæ.
20. *M. citharelloides.*

Shell fusiform, smooth or striated, not spirally ridged ; posterior whorls costate. [Pusio.]
Shell ovate, costæ thick. 21. *M. sordida.*
Shell narrow, costæ angular. 22. *M. semilævis.*

Shell conoidal.
Spire short and broad, last whorl subangulated and tuberculose-costate. 23. *M. cassida.*
Spire narrower, last whorl rounded and spirally lirate.
24. *M. conoidalis.*

SPECIES UNFIGURED AND UNCLASSED.

Mitra anticoronata, *R. M. Johnston*, Proc. Roy. Soc. Tasmania for 1879 [1880], p. 34.

SPURIOUS SPECIES.

Mitra daphnelloides, *T. Woods*, is transferred to *Pleurotomidæ*.

Mitra coarctata, *T. Woods*, represents an immature example of *Marginella Winteri*, Tate.

Thala marginata, *T. Woods*, is transferred to *Pleurotomidæ*.

1. Mitra alokiza, *Tenison Woods.* Plate iv., fig. 8.

Reference.—Proc. Lin. Soc., N.S. Wales, t. 3, fig. 7, p. 8, 1879.

Shell rather thin, shining, narrowly fusiform; spire longer than the aperture, ending in a pullus of two small, narrow, rounded whorls. Whorls nine, excluding the apical ones, nearly flat, suture conspicuously margined anteriorly ; regularly and distantly spirally grooved ; grooves elegantly and closely punctated ; first and second whorls slenderly costated. There are about seven very narrow grooves on the penultimate whorl, whilst a very slender one is interposed between the posterior one and the suture.

Last whorl subangulated in an alignment with the posterior

angle of the aperture, thence gradually attenuated; spirally grooved throughout.

Aperture narrowly elliptic; lip sharp; columella with five plaits, increasing in size from the front.

Dimensions.—Length, 55·5; breadth, 13; height of last whorl, 26·5.

Locality.—Lower beds at Muddy Creek.

The species was established on juvenile examples, which I have traced up to the moderately large specimen herein figured. The figure of the type does not correctly represent the shape, being much too broad.

2. Mitra Dennanti, *spec. nov.* Plate iii., fig. 3.

Shell moderately stout, fusiform-biconic; spire short, ending in a blunt apiculate point; pullus of four whorls, the anterior one large, much embracing the next, the last turn very small subglobose.

Ordinary whorls four, convex, separated by a narrow shallow channelled suture, with a rounded appressed shoulder, regularly spirally grooved; about twelve grooves on the penultimate whorl, crossed by close-set striæ, which produce the appearance of linear oblong punctures in the grooves.

Last whorl somewhat ventricose, the median portion smooth or spirally striated; posteriorly and anteriorly spirally grooved, and neatly punctated.

Aperture elongate-oval, outer lip thin; columella with four plaits, the posterior one the largest.

Dimensions.—Length, 33; breadth, 16; length of aperture, 22. The corresponding measures of a very large specimen are 47, 20, and 30.

Locality.—Lower beds at Muddy Creek (*J. Dennant !*)

3. Mitra dictua, *Tenison Woods.* Plate iv., fig. 9.

Reference.—Proc. Lin. Soc., N.S. Wales, plate iii., fig. 7, p. 8, 1879.

Shell rather thin, elongate-fusiform; spire longer than the aperture, ending in a conoid pullus of three smooth, slightly convex, regularly increasing turns.

Whorls eight, excluding the pullus, nearly flat, separated by a linear impressed suture, the anterior ones by a narrow channelled suture with a rounded shoulder. The first and second have thick costæ and spiral linear grooves, the next three are spirally grooved and obscurely punctated, the whole surface crossed by raised curved threads; thence the spiral grooves gradually merge into threads or striæ.

Last whorl with a few slender striæ at the shoulder, spirally

ridged at the base, medially with conspicuous transverse sigmoid striæ ; somewhat abruptly attenuated below the middle line.

Aperture ovate, outer lip thin ; columella with two inconspicuous anterior plaits, and a large posterior one.

Dimensions.—Length, 40 ; breadth, 13 ; length of aperture, 20.

Localities.—Lower beds at Muddy Creek ; and in well sinking, Murray Desert; Table Cape!

The figured example of which the dimensions are given is from the Murray Desert ; in size it very much exceeds the type specimen from Muddy Creek, which is an immature shell, and whilst the representation of it gives the right proportions, yet it does not show the slight flattening at the suture ; intermediate examples occur at the latter locality.

4. Mitra uniplica, *spec. nov.* Plate iv., fig. 12.

Differs from the foregoing by its more convex whorls more shouldered at the suture, wider body-whorl, which is less attenuated anteriorly, and by its single columella plait.

Dimensions of specimen, wanting posterior part of spire, of five whorls ; length, 49 ; width, 17 ; length of aperture, 26.

Locality.—Blue clays at Schnapper Point.

5. Mitra varicosa, *spec. nov.* Plate v., fig. 1.

Shell stout, fusiformly conic, of seven whorls, ending in a small papillary pullus. Ordinary whorls slightly convex, a little ventricose behind anterior suture, and inconspicuously depressed in the posterior-third ; transversely closely wrinkled and striate, crossed by fine distant equal liræ, about 12 on the penultimate whorl.

Last whorl varicosely dilated at the commencement and at about the middle ; columella with four strong plaits, and two on the posterior part of the aperture.

Dimensions.—Length, 24 ; widtb, 10 ; length of aperture, 13.

Locality.—Clayey-green-sands, Adelaide bore.

6. Mitra atypha, *spec. nov.* Plate iv , fig. 6.

Shell stout, narrow-ovate, blunt at each end ; whorls six, smooth, slightly convex. Aperture oval, outer lip lirate within, columella with four approximate plaits.

Dimensions.—Length, 10; breadth, 4·5; length of aperture, 5.5.

Locality.—Upper beds at Muddy Creek.

7. Mitra complanata, *spec. nov.* Plate v., fig. 12.

Shell rather thin, elongate-ovate, with a blunt apex, and rather attenuated at the front ; whorls six, smooth, shining, slightly convex. Aperture narrow-elliptical ; outer lip sharp, smooth within ; columella with four distant plaits.

Dimensions.—Length, 8; breadth, 3·5; length of aperture, 5.
Locality —Clayey-green-sands, Adelaide bore.

8. Mitra ligata, *spec. nov.* Plate v., fig. 4.

Shell rather thin, elongate-ovate, attenuated at each end; whorls seven, smooth, shining, very slightly convex, perceptibly constricted in front of the anterior suture, giving rise to the appearance of a spiral rib margining the suture. Aperture narrow-elliptical; outer lip sharp, lirate within; columella with five plaits.

Dimensions.—Length, 7; breadth, 3; length of aperture, 4.
Localities.—Lower beds at Muddy Creek; blue clays at Schnapper Point.

9. Mitra othone, *Tenison Woods.* Plate iv., fig. 10.

Reference.—Proc. Lin. Soc., N. S. Wales.

A small biconic shell, pointed at both ends, apex blunt of two and a half smooth whorls. Ordinary whorls separated by an impressed suture, sculptured with spiral threads which are more or less granulose, especially on the posterior part of spire, by transverse liræ or slender costæ. Last whorl lirate and transversely striate; columella with four well-developed plaits.

Dimensions.—Length, 12; breadth, 5; length of aperture, 8.
Locality.—Lower beds at Muddy Creek.

10. Mitra atractoides, *spec. nov.* Plate iv., fig. 11.

Shell narrowly fusiform-biconic, with a moderately elevated spire, ending in a blunt conoidal pullus of four smooth turns. Whorls five, excluding pullus, slightly convex, with a linear suture, sculptured with raised spiral threads and tessellated by curved transverse threads. Last whorl, with cancellate ornament, a little ventricose in front of suture, medially attenuated, but slightly dilated at the front.

Aperture very narrow; outer lip thin, smooth within, medially ecurved; columella nearly straight, with four plaits, the anterior one small.

Dimensions.—Length, 21; breadth, 7; length of aperture, 12.
Locality.—Lower beds at Muddy Creek.

This species has a resemblance to *M. othone*, but differs by its long spire, sub-cylindric pullus, and by certain details of its ornamentation.

11. Mitra escharoides, *spec. noa*, Plate v., figs. 8a—*b*.

Shell stout, narrow-fusiform, ending in a sub-cylindric pullus of two smooth whorls. Whorls six, excluding pullus, slightly convex; sculptured with broad, flat, transverse ribs, and by narrower spiral ones, which include between them large, roundly ob-

long depressions; there are eight rows of punctures on the penultimate whorl.

Last whorl a little sloping to the suture, but slightly attenuated to the bent and reverted short beak. Aperture narrow, oval-oblong, with a spiral callosity at the posterior angle; outer lip thin, slightly ecurved medially, stoutly lirate within; columella with four thick approximate plaits, increasing in size from the front.

Dimensions.—Length, 17; width, 5; length of aperture, 8.

Locality.—Lower beds at Muddy Creek.

12. Mitra leptalea, *spec. nov.* Plate v., fig. 3.

Shell turriculate, ending in a large sub-globose pullus with the tip laterally immersed. Whorls seven, excluding pullus, nearly flat, suture impressed; ornamented with numerous straight, slender, sub-acute transverse ribs closely and neatly striate in between, and crossed by fine, somewhat inequi-distant and unequal spiral threads (about 15 on penultimate whorls). Last whorl ovate-oblong; abruptly attenuated to a long beak, which is encircled by thick ribs, the posterior one subgranose. The posterior half of the whorl is slenderly costated and spirally lined, and is bounded anteriorly by a narrow belt devoid of spiral threads, and defined above and below by a slight angulation.

Aperture narrow-ovate, prolonged into a long beak, a little effuse anteriorly and slightly reverted; outer lip thin, smooth within; columella with four plaits.

Dimensions.—Length, 16; breadth, 5; length of aperture, 7.

Locality.—Lower beds at Muddy Creek.

13. Mitra euglypha, *spec. nov.* Plate v., fig. 13.

Shell broadly turriculate, ending in a subcylindric pullus of two and a half smooth turns. Whorls six, excluding pullus, convex, slightly depressed over the posterior suture; ornamented with numerous thick transverse ribs, which are crossed by stout spiral threads, about six on penultimate whorl, producing nodulations more or less distinct on the costæ.

Last whorl oblong-ovate, abruptly attenuated to a short stout beak, ornamented with slightly sigmoid costæ, which are more or less nodulated by the intersection of broader spiral liræ.

Aperture oblong-ovate, obtusely-angular behind; outer lip thin, lirate within; columella with four stout approximate plaits,

Dimensions.—Length, 15; breadth, 5·5; length of aperture, 7.

Locality.—Gippsland (*W. H. Gregson!*).

14. Mitra exilis, *spec. nov.* Plate viii., fig. 5.

Shell small, slender, turriculate, ending in a relatively large mamillate pullus of two smooth turns. The other whorls four, convex, with a very narrow oblique slope to the posterior suture,

the shoulder defined by a thick spiral rib, ornamented by very thick, angularly rounded, straight ribs (about 15 on the penultimate whorl), separated by very much narrower interspaces. Aperture oval-oblong, squarely rounded behind, abruptly contracted to a somewhat short and slender beak. Outer lip thin, smooth within; columella with three or four plaits.

Dimensions.—Length, 5·5; breadth, 1·75; length of aperture, 2.

Locality.—Lower beds at Muddy Creek.

15. Mitra paucicostata, *spec. nov.* Plate v., fig. 2.

Shell turriculate, ending in a relatively large pullus of two smooth convex turns, the top laterally immersed.

Whorls four and a half, excluding pullus, medially subangulated, ornamented with slightly bent angular costæ, which are subtuberculated on the spiral keel and at each suture (15 on penultimate whorl); interspaces faintly striated transversely.

Last whorl oblong, abruptly attenuated to a short, broad, reverted beak, which is spirally ridged; flatly rounded at the suture, ornamented with acute costæ, a slightly tuberculate antesutural keel, and two approximate tubercular ridges in an alignment with posterior angle of the aperture. Outer lip thin, roundly insinuated at the suture; internally lirate; columella with four stout approximate plaits.

Dimensions.—Length, 8·5; breadth, 4·5; length of aperture, 4.

Localities.—Lower beds at Muddy Creek; blue clays at Schnapper Point.

16. Mitra terebræformis, *spec. nov.* Plate v., fig. 5.

Shell fusiformly elongate, smooth, shining, ending in a stout high pullus of two turns, the first very small. Whorls six and a half, excluding pullus, nearly flat, ornamented by much curved angular plications, separated by very much broader shallow depressions; the posterior suture margined by a narrow band, defined by a thread-like keel.

Last whorl gradually attenuated into a short, broad, upturned beak, the curved costæ becoming obsolete in front of the middle line; the beak is spirally ridged.

Aperture ovate, angular behind; outer lip thin, smooth within; columella with four approximate plaits.

Dimensions.—Length, 16; breadth, 5; length of aperture, 7.

Locality.—Upper beds at Muddy Creek.

The shape, the curved costæ, and the antesutural band recall some of the leading characteristics of *Terebra*, and separate this species from all others of the genus, recent and fossil.

17. Mitra clathurella, *spec. nov.* Plate viii., fig. 8.

Shell small, fusiformly ovate, with a short obtuse pullus. Whorls four, excluding pullus, convex, margined and concavely depressed at the posterior suture; ornamented with rather slender oblique costæ (about 20 on the penultimate whorl), fine transverse striæ, and spiral threads, anterior to the antesutural depression (six on the penultimate whorl).

Last whorl with slender costæ, tessellated by spiral threads, the inter-depressions finely transversely striate.

Aperture narrow-oblong, contracted in front to a short broadish, bent, and slightly reverted beak. Outer lip slightly ascending on the penultimate whorl, slightly emarginate at the suture, smooth within; columella with four rather distant transverse plaits.

Dimensions. — Length, 6; breadth, 2·75; length of aperture, 4.

Locality.—Lower beds at Muddy Creek.

This species has much the aspect of a *Clathurella.*

18. Mitra biornata, *spec. nov.* Plate v., fig. 10.

Shell rather thin, narrow-fusiform, ending in a blunt pullus of one and a half smooth turns. Whorls, five, excluding pullus, convex, separated by an impressed suture; sculptured with slender, flat, spiral threads, and transversely finely striated, the three posterior whorls transversely plicate; there are about 18 spiral threads on the penultimate whorl.

Aperture narrow-oval, contracted into a short wide beak; outer lip thin, crenately wrinkled at the front, lirate within; columella with five plaits, the two posterior and larger ones biplicate.

Dimensions.—Length, 10·5; breadth, 3·5; length of aperture, 5.

Locality.—Lower beds at Muddy Creek.

19. Mitra subcrenularis, *spec. nov.* Plate v., fig. 6.

Shell rather thin, broadly fusiform, ending in a blunt papillary pullus of two and a half smooth turns. Whorls, five, excluding pullus, nearly flat, and slightly flattened at the anterior suture; sculptured with linear spiral grooves, and on the posterior whorls with transverse plications, which end posteriorly in granular crenatures.

Last whorl somewhat ventricose behind, spirally lirate, but the costæ are obsolete, or reduced to mere crenulations at the suture. Base rapidly attenuated in a short narrow beak. Outer lip thin, smooth within; columella with four distant plaits.

Dimensions.—Length, 11; breadth, 4·5; length of aperture, 6.5.

Locality.—Clayey-green-sands, Adelaide bore.

20. Mitra citharelloides, *spec. nov.* Plate v., fig. 11.

Shell narrow, ovately fusiform, ending in a moderately wide and large pullus of two convex turns. Ordinary whorls four and a half, convex, more sloping to, and slightly depressed at, the posterior suture; sculptured with fine, close spiral threads, about 20 on penultimate whorl, and ornamented with broad, rounded costæ, which end subtuberculosely at the posterior-third (ten on the penultimate whorl).

Last whorl gradually attenuated to the short, slightly reverted beak, spirally lirate throughout, and wrinkled transversely, the costæ entirely absent, or with one or two obsolete ones at the hinder part. Aperture narrow-oval; outer lip smooth within; columella with two slender plaits, situated at about the middle.

Dimensions.—Length, 9·5; breadth, 3·5; length of aperture, 5.

Localities.—Turritella-marls, Blanche Point, Aldinga Bay; clayey-green-sands, Adelaide bore.

This species has much the aspect of some species of *Cithara*, but there is no trace of a sutural notch.

21. Mitra sordida, *spec. nov.* Plate vi., fig. 6.

Shell small, stout, oval-oblong, blunt at both ends; whorls five, convex, smooth, ornamented with thick curved costæ (ten on penultimate whorl). Last whorl oblong, hardly attenuated at the front; the posterior-half with five costæ, the anterior-half smooth; base spirally striate.

Aperture narrow-oval; outer lip thin, much arched, slightly insinuate at the suture; stoutly lirate within; columella with four stout plaits.

Dimensions.—Length, 6·5; breadth, 3; length of aperture, 4.

Locality.—Upper and lower beds at Muddy Creek.

22. Mitra semilævis, *spec. nov.* Plate v., fig. 9.

Shell minute, narrowly oval-oblong, with a large, blunt apex. Ordinary whorls three, slightly convex, a little margined at the anterior suture, ornamented with curved sub-angular costæ, which are thicker at the anterior suture, and a few spiral striæ posteriorly; there are twelve costæ on the posterior whorl.

Last whorl attenuated into a longish, slightly reverted beak; faintly spirally striate next the suture, transversely wrinkled in the posterior half-turn. Aperture narrow oval; outer lip lirate within; columella with four stout plaits, which are continued as spiral ridges around the beak.

Dimensions.—Length, 5·5; breadth, 2; length of aperture, 3.

Localities.—Lower beds at Muddy Creek; blue clays at Schnapper Point.

23. Mitra cassida, *spec. nov.* Plate vi., fig. 5.

Shell small, stout, biconic, with a very short, somewhat acuminate spire, ending in a relatively large papillary pullus. Ordinary spire whorls convex, ornamented with slender costæ.

Last whorl ventricose posteriorly, abruptly sloping to the suture, and rapidly attenuated to the front; the shoulder of the whorl ornamented with transverse sub-tuberculose ridges.

Aperture narrow-elliptic; outer lip thin, smooth; columella with four plaits.

Dimensions.—Length, 7; breadth, 4; length of aperture, 5·5.

Locality.—Upper beds at Muddy Creek.

24. Mitra conoidalis, *spec. nov.* Plate x., figs. 2*a*—*b*.

Shell small, stout, biconic, with a short regularly conic spire, ending in a relatively large depressed pullus; ordinary spire whorls nearly flat, sloping more rapidly to the anterior suture, and slightly margined at the posterior suture; ornamented by slender costæ and a few spiral engraved lines.

Last whorl oblong, rather abruptly attenuated at the base, flatly rounded over the suture; with a few revolving threads at the shoulder and at the base, the median portion transversely striate.

Aperture narrow-elliptic; outer lip thin, smooth; columella with four plaits.

Dimensions.—Length, 7; breadth, 3·5; length of aperture, 5·5.

Locality.—Lower beds at Muddy Creek.

FAMILY OLIVIDÆ.

Genus Oliva.

It is not possible to separate conchologically *Olivella* from *Oliva*, as the only difference between them is the longer or shorter spire, which is by no means an absolute measure, though it is not improbable that the following species may belong to the former genus.

SYNOPSIS OF SPECIES.

Length more than three times the breadth.	1. *O. angustata.*
Length less than three times the breadth.	
Shell narrower; spire longer.	2. *O. Adelaidæ.*
Shell wider; spire shorter.	3. *O. nymphalis.*

1. Oliva angustata, *spec. nov.* Plate viii., figs. 7*a*—*b*.

Shell narrowly elongate-ovate, shining; spire acuminate, of six whorls; suture excavated; aperture narrow, longer than the spire; columella twisted with five or six anterior spiral grooves.

Dimensions.—Length, 18·5; breadth, 5·5; length of aperture,

11·5 ; breadth of aperture at front, 2. Imperfect specimens have a length of 25 mills.

Locality.—Lower beds at Muddy Creek.

A very much more slender shell, with a longer spire, than *O. australis*, Duclos.

2. Oliva Adelaidæ, *spec. nov.* Plate viii., fig. 6.

Shell elongate-ovate, shining ; spire bluntly acuminate, of four whorls, channelled at the suture ; aperture longer than the spire; outer lip slightly arched, truncate at the base ; columella slightly twisted and plicate anteriorly.

Dimensions. — Length, 10.5 ; breadth, 4 ; length of aperture, 6.

Locality.—Clayey-green sands, Adelaide-bore.

This fossil has the general appearance of *O. pardalis* and *O. leucozona*, of New South Wales, but it is proportionately stouter, the apex is blunt, and the aperture is longer and narrower at the front. The relative dimensions respectively of *O. Adelaidæ* and *O. pardalis* are—Length, 10 and 10 ; breadth, 3·8 and 3·3 ; length of aperture, 6·3 and 6·5.

3. Oliva nymphalis, *spec. nov.* Plate viii., fig. 7.

Shell acuminately oblong, with a moderate exsert spire, ending in a small subglobose tip ; whorls five, narrowly channelled at the suture.

Very much like *O. nivea*, Gmelin, but it is more ventricose, wider, and not so deeply grooved at the suture ; it also resembles *O. triticea*, Duclos, but has a shorter spire.

Dimensions.—Length, 10 ; breadth, 4·5 ; length of aperture, 6·5.

Localities.—Bairnsdale, Jemmy's Point, and Cunninghame, Gippsland (*W. H. Gregson !*); upper beds at Muddy Creek (*J. Dennant !*).

Genus Ancillaria.

synopsis of species.

Enamel of spire spirally ridged.
  Spire acuminate; apex pointed; broadly depressed at suture. 1. *A. orycta.*
  Spire cylindrical; apex papillary. 2. *A. papillata.*
  Spire subscalar. 3. *A. subgradata.*
Enamel of spire without spiral ridges.
  Spire tumid; shell subcylindrical. 4. *A. hebera.*
  Spire tapering.
    Non-callous surface of shell conspicuously spirally striated. 5. *A. subampliata.*
    Non-callous surface plain or obscurely spirally striated.

Callosity of spire coarsely granulose.
6. *A. lanceolata.*
Callosity of spire smooth, or nearly so.
Spire subcylindrical, obtuse. 7. *A. ligata.*
Spire pyramidal, acute.
Elongate fusiform; aperture about half total length.
8. *A. semilævis.*
Aperture about two-thirds total length.
9. *A. pseud-australis.*

1. Ancillaria orycta, *spec. nov.* Plate x., fig. 5.

Shell stout, ovately fusiform; spire acuminate, with an acute tip, spirally ridged; last whorl rather ventricose, margined at the suture by a rather broad callous band, concavely and deeply depressed.

In shape and sculpture similar to *A. marginata*, but the apex is acutely pointed, and the whorls are broadly and deeply furrowed at the suture.

Dimensions of a large specimen :—Length, 23; breadth, 12; length of aperture, 14.

Localities.—Oyster-banks, Aldinga Cliffs; Jemmy's Point and Cunninghame, Gippsland (*W. H. Gregson !*); ferruginous sand-rock, Cheltenham, Victoria.

2. Ancillaria papillata, *spec. nov.* Plate vii., fig. 4.

Shell solid, cylindrically oblong; spire pyramidally acuminate and mucronate, ending in a small blunt exsert pullus; the callous growth on the spire smooth, shining, microscopically granular, and sculptured with narrow, sharply rounded, spiral ridges of unequal size, the larger with two or three smaller ones interposed. Aperture a little more than half the total length.

Dimensions (mean).—Length, 25; breadth, 9·25; length of aperture, 14.

Locality.—Upper beds at Muddy Creek.

3. Ancillaria subgradata, *spec. nov.* Plate vii., fig. 8.

Shell thin, broadly fusiform, with a moderately long gradated spire ending in a small, smooth, swollen pullus; whorls rather ventricose, angulated near the posterior suture; the revolution of the suture marked by a raised thread.

This species recalls the recent Australian *A. cingulata*, but it has a much shorter spire, and the whorls are more sharply angled.

Dimensions.—Length, 29; breadth, 12·5; length of aperture, 15.

Locality.—Clayey green-sands Adelaide-bore.

4. Ancillaria hebera, *Hutton.* Plate vii., fig. 5.

Reference.—Catalogue Tertiary Moll. of N. Zealand, p. 6, 1873.

Synonym.—A. mucronata, *Johnston*, Geol. Tasmania, t. 31, f. 12, 1880.

Shell rather thin, cylindrical; spire short, thick, and bluntly rounded at the end; the callosity of the spire broader than the body-whorl, spirally constricted at the suture, coarsely granulose.

Dimensions (mean).—Length, 22·5; breadth, 9·25; length of aperture, 13·75.

Locatities.—Calciferous sandstones of the River Murray Cliffs near Morgan; lower beds at Muddy Creek; Table Cape *(Johnston!);* also in the Oamaru and Pareora systems in New Zealand.

The identification of the Australian specimens results from a comparison with an authentic example from New Zealand.

This species comes nearest to *A. olivula*, of the Paris basin, but the callosity is larger, gibbous, and granulated in our fossil.

5. Ancillaria subampliata, *spec. nov.* Plate vii, fig. 3.

Shell thin, fusiformly oblong, rather narrow, with an acuminate, subturreted spire, ending obtusely in a moderately large pullus of three smooth slightly convex whorls; callosity of spire spirally striated.

Body-whorl sculptured with revolving and longitudinal striæ; basal grooves wanting.

Aperture inflated anteriorly; columella hardly twisted, with slender plaits.

Dimensions.—Length, 34; breadth, 13; length of aperture, 24.

Locality.—Lower beds at Muddy Creek *(J. Dennant).*

This species has the form of *A. ampla*, Gmelin, but the spire is different in outline, and the surface of the body whorl is sculptured.

6. Ancillaria lanceolata, *spec. nov.* Plate vii., fig. 2.

Shell moderately stout, narrow, cylindrical; spire pyramidal, acuminately contracted at the apex, thickly covered with a coarsely granulated enamel. Somewhat intermediate between *A. hebera* and *A. pseud-australis.*

Dimensions (mean).—Length, 33·5; breadth, 10·75; length of aperture, 19·5.

Locality.—Lower beds at Muddy Creek.

7. Ancillaria ligata, *spec. nov.* Plate vii., fig. 6.

Shell small, oblong-cylindrical; spire sub-cylindrical, blunt, covered with a thin enamel; constricted at the suture and

bounded behind by a narrow flat band. In young specimens the callous growth occupies a broad zone around the anterior suture, leaving a dark coloured narrow belt at the posterior suture.

Dimensions.—Length, 19 ; breadth, 6 ; length of aperture, 9.

Localities—Turritella-clays at Blanche Point, Aldinga ; clayey green-sands, Adelaide-bore.

This resembles *A. semilævis*, T. Woods, but has a blunt apex, and is more strongly angled at the suture.

8. Ancillaria semilævis, *Tenison Woods.*

Reference.—Proc. Linnean Soc., N.S. Wales, 1879, p. 229, tab. 20, fig. 7.

A slender elongately fusiform shell, with the aperture less than half the total length ; spire acuminately pointed, slightly angled at the sutures ; callosity of spire minutely granular.

Dimensions.—Length, 19 ; breadth, 6 ; length of aperture, 9.

Localities.—Lower beds at Muddy Creek ; River Murray Cliffs ; Schnapper Point.

9. Ancillaria pseud-australis, *spec. nov.* Plate vii., fig. 1.

Shell stout, fusiformly ovate ; spire pyramidally acuminate, a little constricted anteriorly, thence tapering to a small mamillary pullus. Callus of spire obscurely spirally lined and minutely granulated.

Last whorl slightly ventricose, tumid in front of the suture. The two basal grooves each ending in a denticle on the outer lip. Columella twisted, with thin plaits.

Dimensions of a moderately sized specimen :—Length, 47 ; breadth, 19 ; length of aperture, 26·5.

Localities.—Lower beds at Muddy Creek ; River Murray Cliffs, near Morgan ; well-sinkings, Murray Desert; blue clays, Schnapper Point.

This species has been referred to the living species *A. australis* and *A. mucronata ;* from the former it is more markedly distinct. The Tasmanian conchologists believe that the latter species was founded on a fossil from Table Cape, but Sowerby's and Reeve's illustrations indicate a highly coloured and therefore presumably a living shell, and in my opinion a different shell from the fossil, which may be distinguished by its longer and constrictedly acuminate spire.

A. pseud-australis is not unlike *A. buccinoides* of the European Eocene, which is, however, less ventricose.

The unique specimen from a well-sinking in the Murray desert, represented by fig. 13, plate vi., is provisionally referred to *A. pseud-australis* as an obtuse variety resembling *A. obtusa* from Cape of Good Hope. Detached spires similar to that of this

variety, attaining to a diameter of 31 mills., occur in the River Murray Cliffs, but the perfect shell is yet unknown.

Genus Harpa.

SYNOPSIS OF SPECIES.

Whorls rounded at the shoulder.
  Pullus turbinate; lamellæ thin, elevated, about 50 on last whorl. 1. *H. lamellifera.*
Whorls angulated or sub-angulated at the shoulder.
  Whorls sulcated around suture; lamellæ thin, about 40 on last whorl. 2. *H. sulcosa.*
  Spire whorls sub-quadrate; strongly ribbed spirally and axially; spire more than half length of aperture. 3. *H. spirata.*
  Whorls upward-sloping to posterior suture.
    Spire whorls roundly angled.
      Spire less than one-fifth length of aperture; ribs on last whorl, 12, conspicuously lirate above and below angulation of last whorl. 4. *H. cassinoides.*
      Spire less than one-third length of aperture.
        Pullus papillary, nucleus small, lateral; outer lip slightly expanded.
          Lamellæ on last whorl about 20, transversely striate; no liræ 5. *H. abbreviata.*
          Lamellæ on last whorl about 25, lirate and transversely striate. 6. *H. tenuis.*
        Pullus large, hemispheric.
          Lamellæ about 25 on last whorl; outer lip thickened. 7. *H. pulligera.*
    Spire whorls bicarinate at periphery, costæ and liræ distant and prominent. 8. *H. clathrata.*

1. Harpa lamellifera, *spec. nov.* Plate vi., fig. 2.

Shell ovate, ventricose; spire very short, ending in a moderately large turbinate pullus of two smooth rounded whorls, the last half turn almost concealed. Ordinary whorls, two and a half, convex; ornamented with thin elevated lamellæ, about 50 on the last whorl; interspaces finely transversely striate and spirally lined. Aperture lunate; outer lip not thickened, sigmoidally curved coincident with the lamellæ.

Dimensions.—Length, 29; breadth, 19; length of aperture, 24; width, 10.

Locality.—Lower beds at Muddy Creek.

2. Harpa sulcosa, *spec. nov.* Plate vi., fig. 10.

Shell ovate, ventricose; spire short, scalar, ending in a large pullus of two smooth turns, the last turn subglobose, with the tip laterally immersed. Ordinary whorls, two and a half, flatly channelled at the suture; ornamented with thin subdepressed lamellæ, about 40 on the last whorl, which terminate at the shoulder in small vaulted scales; interspaces indistinctly striate, and inconspicuously distantly spirally lined. The flat or slightly concave posterior area of the whorls spirally striated and traversed by the depressed lamellæ.

Aperture lunate, truncated posteriorly corresponding with the sutural depression; outer lip not thickened, sigmoidally curved.

Dimensions.—Length, 19; breadth, 11·5; length of aperture, 15.

Locality.—Lower beds at Muddy Creek.

3. Harpa spirata, *spec. nov.* Plate vi., fig. 3.

Shell oval-oblong, with a high subscalar spire, ending in a hemispheric pullus. Ordinary whorls, three and a half, bluntly angled in front of the suture, the posterior area flat or slightly sloping upwards. Ornamented with stout depressed lamellæ, about 30 on last whorl, and distant spiral ribs about three on penultimate whorl; interspaces between the lamellæ finely transversely striate.

Aperture oval-oblong; outer lip thickened and reflected.

Dimensions.—Length, 35; breadth, 22; length of aperture, 25.

Locality.—Blue clays at Schnapper Point.

4. Harpa cassinoides, *spec. nov.* Plate vi., fig. 4.

Shell stout, biconic, with a very short somewhat acuminate spire ending in a small papillary pullus of two turns.

Ordinary spire-whorls two, medially angled, with a slight concave posterior area; ornamented with distant ribs which rise into blunt tubercles on the angulation.

Last whorl oval, ventricose, flatly rounded over the suture, and rapidly attenuated at the base; periphery with three equal and equidistant liræ; axial ribs twelve, subangular, sigmoid, somewhat elevated into blunt tubercles on the peripheral liræ.

Aperture lunate; outer lip ascending on the penultimate whorl, very much thickened and somewhat patulously spreading.

Dimensions.—Length, 28; breadth, 23; length of aperture, 27.

Locality.—Well-sinking, Murray Desert.

5. Harpa abbreviata, *spec. nov.* Plate vi., fig. 7.

Shell thin, narrow-oval, with a short spire ending in a moderate sized blunt apex. Ordinary spire-whorls two, subangulated medially, with two spiral threads at the periphery, and ornamented by rather distant, hardly raised lamellæ.

Last whorl oval-oblong, somewhat ventricose, flatly rounded over the suture; ornamented with about twenty, thin, hardly elevated lamellæ; interspaces axially striated.

Aperture oval-oblong; outer lip ascending to periphery of penultimate whorl, somewhat patulously expanded, especially at the two ends.

Dimensions.—Length, 27; breadth, 17; length of aperture, 24.

Locality.—Lower beds at Muddy Creek.

6. Harpa tenuis, *spec. nov.* Plate vi., fig. 1.

Shell thin, oval, with a rather short spire, ending in a rather large blunt apex. Ordinary spire-whorls two, convex, but with an ill-defined ante-medial angulation; ornamented with thin, slightly elevated lamellæ, and transversely interstriated.

Last whorl oval, slightly ventricose over the suture; ornamented with about 25 thin, slightly elevated lamellæ, which develope vaulted pointed scales on the shoulder, and with distant, not prominent, flat spiral threads, which are more conspicuous on the base in the form of wrinkled corrugations.

Dimensions.—Length, 36; breadth, 23; length of aperture, 29.

Locality.—Lower beds at Muddy Creek.

7. Harpa pulligera, *spec. nov.* Plate vi., fig. 9.

Shell thin, oval, with a rather short spire, ending in a very large hemispheric pullus, with the tip laterally immersed; the second turn of the pullus almost concealed by the first ordinary whorl. Ordinary whorls one and a half, subangulated; ornamented with thin, slightly elevated lamellæ, which are vaulted on the angulation.

Last whorl oval-oblong, somewhat ventricose over the suture, ornamented with about 25 thin, slightly elevated lamellæ, which are raised into vaulted scales on the shoulder; the interspaces with coarse axial striæ; base spirally wrinkled.

Aperture narrow-oval; outer lip slightly ascending on the penultimate whorl, its margin much thickened.

Dimensions.—Length, 50; breadth, 30; length of aperture, 42; diameter of pullus, 4·5.

Locality.—Blue clays at Schnapper Point.

8. Harpa clathrata, *spec. nov.* Plate vi., fig. 8.

Shell moderately stout, narrow-oval, with a short spire ending in a moderately sized papillary pullus. Ordinary spire-whorls two, angulated medially, and with a strong thread between the angulation and the anterior suture, and ornamented with distant thin angular costæ, the interspaces with a few transverse wrinkles of growth.

Last whorl oval, somewhat ventricose and flatly rounded over

the suture, attenuated at the base; ornamented with about 18 angular costæ, and about 20 equal and equi-distant broad flat liræ, but narrower than the interspaces; the whole surface with conspicuous wrinkles of growth.

Dimensions.—Length, 36; breadth, 21; length of aperture, 30.

Locality.—Calciferous sandstones, River Murray cliffs, near Morgan.

FAMILY CANCELLARIDÆ.

Genus Cancellaria.

SYNOPSIS OF THE SPECIES.

Shell umbilicated.
- Whorls lirate and costulated, deeply channelled at the suture; widely umbilicated. 1. *C. calvulata.*
- Whorls lirate, costæ broad, widely channelled; narrowly umbilicated. 2. *C. laticostata.*
- Whorls spirally ribbed, fenestrated by fine threads; suture not channelled; widely umbilicated. 3. *C. alveolata.*

Shell imperforate.
- Whorls variced.
  - Suture channelled; strongly lirate.
    - Interspaces between spiral ribs finely striate. 4. *C. epidromiformis.*
    - Interspaces with a strong thread. 5. *C. exaltata.*
  - Suture not channelled; finely lirate. 6. *C. varicifera.*
- Whorls not variced.
  - Whorls squarely shouldered.
    - Whorls more or less tessellated; shell oval.
      - Liræ on last whorl more than 10; posterior area with a spiral thread. 7. *C. gradata.*
      - Liræ on last whorl about 10. 8. *C. ptychotropis.*
    - Whorls strongly costated; spire turreted. 9. *C. turriculata.*
  - Whorls rounded.
    - Shell oval.
      - Costæ well developed, roundly angular, extending to base of last whorl. 10. *C. Wannonensis.*
      - Costæ rounded, thick, on medial portion of last whorl only. 11. *C. semicostata.*
      - Lirate without costæ. 12. *C. modestina.*

Shell turriculate.
Penultimate whorl subangulate with subtuberculose costæ and 4 liræ.
Last whorl with about 20 liræ; penultimate whorl with 10 costæ. 13. *C. Etheridgei.*
Last whorl with 10 liræ; penultimate whorl with 12 costæ; finely striated transversely. 14. *C. caperata.*
Penultimate whorl convex with slender costæ, and 7 to 10 liræ.
Costæ nodosely crenulate; last whorl rather ventricose. 15. *C. capillata.*
Costæ arcuate, thin; liræ fewer. 16. *C. micra.*

1. Cancellaria calvulata, *spec. nov.* Plate ix., fig. 3.

Shell ovately ventricose, rather thin; spire moderate, turbinated, ending in an eccentric pullus of one and a half smooth swollen whorls. Whorls three, excluding pullus, very convex, separated by a rather narrow and deep channelled suture, the shoulder rounded. Sculptured with rounded spiral ribs alternately large and small (about fifteen on penultimate whorl), with obscure transversely oblique plications (about twenty on penultimate whorl), which crenulate the liræ, and with close-set transverse thread-like striæ.

Aperture ovate, sharply angled at the front; outer lip thin, a little spreading, crenulate on the edge, and strongly and closely ribbed within; columella oblique with three plaits; umbilicus moderately wide and deep.

Dimensions.—Length, 16; breadth, 12; length of aperture, 10; diameter of umbilicus, 2.

Locality.—Blue clays at Schnapper Point.

By its rounded whorls and ornament it differs from all living species of the Section Trigonostoma, but has much resemblance to *C. expidea*, of the Piedmontese Pliocene, from which it differs by its more exsert spire, narrow channel, and the more numerous transverse plications.

2. Cancellaria laticostata, *Tenison Woods.*

Reference.—Proc. Lin. Soc., N.S. Wales, vol. iv., tab. 2, fig. 8, p. 17; 1879.

A small ovate shell, spire obtusely turreted, whorls separated by a deep channel, broadly ribbed (10 on last whorl), decussate. Aperture entire, angular; outer lip simple, ribbed within; colu-

mella with two stout plaits, umbilicus narrow and deep. Length, 6 ; breadth, 3·5.

Locality.—Lower beds at Muddy Creek !

C. laticostata may be regarded as a diminutive *C. hæmastoma*, Sowerby, from the Gallapagos Islands, but has a little longer spire and broader plications.

The species name is preoccupied by Kuster for a recent shell, which is probably *C. sinensis*, Reeve, a variety of *C. asperella*, Lamarck, but under the circumstances it is not desirable to substitute another name for our fossil.

3. Cancellaria alveolata, *spec. nov.* Plate x., fig. 7. *a-b.*

Shell small, thin, ovate-ventricose ; spire short, turbinate ending in a small blunt pullus of one and a half smooth depressed turns. Whorls three and a half, moderately convex, separated by a linear channelled suture ; equally and equidistantly lirate, five on the penultimate whorl, the posterior one margining the suture ; liræ rounded, depressed, about equal in width to the interspaces, which are roundly pitted by the intercrossing of slender sigmoid threads. Aperture ovately oblong, angularly rounded at the front, but not channelled ; outer lip varicosely thickened, the edge inflected and crenulated, smooth within, slightly insinuate at the suture; peristome entire; columella arched, obscurely one-plicate. Perhaps not a *Cancellaria.*

Dimensions.—Length, 4·5 ; breadth, 3 ; length of aperture, 3.

Locality.—Lower beds at Muddy Creek.

4. Cancellaria epidromiformis, *spec. nov.* Plate viii., fig. 9.

Shell thick, ovately elongate, with a sub-turreted spire ending in a small obtuse apex of one and a half turns. Whorls five, excluding pullus, convex, narrowly and deeply excavated at the suture, the shoulder rounded and coronated ; varices four, at irregular intervals ; ornamented with slender, oblique, subacute costæ (about 24 on penultimate whorl) and spiral liræ (about five on penultimate whorl), bluntly tuberculose or granulose at the junctions ; interspaces between the liræ with about four or five threads, minutely granular or scaly produced by close-set longitudinal striæ.

Aperture oblong ; outer lip varicosely thickened, plicate within; columella lip expanded, columella with three stout plaits ; body-wall with a stout spiral ridge and a few carunculations.

Dimensions.—Length, 20 ; breadth, 10 ; length of aperture, 10.

Locality.—Lower beds at Muddy Creek.

5. Cancellaria exaltata, *spec. nov.* Plate viii., fig. 10.

Shell like *C. epidromiformis*, but rather narrower, with the sutural channel less defined, and with certain differences of orna-

mentation. The costæ are acute, slightly curved, about 16 on penultimate whorl, and about five sharp spiral liræ which serrulate the costæ ; the interspaces between the liræ with one to three stout threads ; the whole surface with longitudinal threads or coarse striæ, which do not produce so fine and close sculpturing on the spiral threads as in the allied species.

Dimensions.—Length, 19·5 ; breadth, 8·5 ; length of aperture, 9.

Locality.—Blue clays at Schnapper Point.

This species recalls *C. macrospira* of the China Seas, but is not so elongate, with a narrower channelled suture and strong costæ ; moreover, the recent species is semi-pellucid, and has a minute umbilicus.

6. Cancellaria varicifera, *Tenison Woods.*

Reference.—Proc. Lin. Soc., N.S. Wales, vol. 3, tab. 21, f. 12, p. 231, 1878.

Shell ovate, spire elevated, subacute, variced, solid, ending in a small smooth pullus of 1½ turns. Whorls five, convex, longitudinally costated, costæ slender, arched (about 20 on penultimate whorl), and regularly lirate (about 15 on penultimate whorl) ; distantly cancellated by longitudinal stout striæ. Outer lip thin, lirate within ; columella triplicate.

Dimensions.—Length, 19 ; breadth, 9 ; length of aperture, 7.

Localities.—Lower beds at Muddy Creek ; River Murray Cliffs ; blue clays at Schnapper Point.

This is the antipodean analogue of *C. evulsa*, Solander, of the European Eocene, differing only by its much finer ornament, and by the liræ within the outer lip.

7. Cancellaria gradata, *spec. nov.* Plate x., fig. 12.

Shell thin, broadly ovate, carinate, with a moderately long, acute, scalar spire, ending in a small pullus of one and a half very convex turns.

Whorls four and a half, excluding pullus, flattened above, angulated in the posterior one-third, of regular increase ; the last whorl is large and ventricose, with an elongated convex base and a very small broad beak. Suture impressed. Anterior portion of whorls tessellated by acute spiral ridges (six on the penultimate) and more slender, straight transverse threads, producing very small acute tubercles at the intersections ; the oblong depressed interspaces transversely striated.

The keel is serrately crenulated ; the posterior area with a median spiral thread, arched transverse striæ, and oblique plications, which become obsolete before reaching the suture.

Aperture quadrately oval, angulated at the keel and at the base of the pillar. Outer lip crenulated on the thin edge, lirate within.

Columella with a slight twist at the front, and with three distinct folds above it.

Dimensions.—Length, 13·5 ; breadth, 7; length of aperture, 7.

Localities.—Lower beds at Muddy Creek. Calciferous sandstone, River Murray Cliffs, near Morgan.

8. Cancellaria ptychotropis, *spec. nov.* Plate ix., fig. 5.

Shell broadly ovate, similar to *C. gradata*, but the spiral liræ and transverse threads are fewer and more distant, and the posterior area of the whorls is without a spiral thread, whilst the liræ are simply crenulated and not tuberculated.

Dimensions.—Length, 6·25 ; breadth, 3·5 ; length of aperture, 3·5.

Locality.—Turritella-clays at Blanche Point, Aldinga Bay.

9. Cancellaria turriculata, *spec. nov.* Plate x., fig. 14.

Shell oval-turreted, carinate, rising in high narrow steps, ending in a broad, blunt, conical pullus. Whorls four, excluding pullus, narrowly flattened above, of regular increase ; ornamented with sub-acute, distant, slightly curved costæ (about 11 on the penultimate), which are tuberculosely thickened at the keel, and with slender spiral threads in front of the keel (about six on penultimate whorl).

Last whorl narrow, with an elongate convex obtuse base ; costate and lirate ; aperture elliptical, roundly angled at the keel; columella with two small plaits.

Dimensions.—Length, 5·75; breadth, 2·5; length of aperture, 2.

Localities.—Turritella-clays, Blanche Point, Aldinga Bay; clayey green-sands, Adelaide-bore.

10. Cancellaria Wannonesis, *spec. nov.* Plate viii., fig. 11.

Shell stout, fusiformly ovate, ventricose; spire sharply acuminate, ending in a sub-cylindric pullus of two and a half turns. Whorls 4, excluding pullus, flatly convex posteriorly, then regularly rounded to the front ; strongly ribbed and spirally lirate.

Last whorl with about 10 to 12, narrowly rounded, elevated, obliquely arched ribs, most prominently elevated in the median portion of the whorl, becoming obsolete at the front ; costæ serrately crenulated by numerous spiral angular liræ, alternately large and small ; the liræ somewhat rugulose on the edge by the crossing of transverse striæ and folds of growth.

Aperture broadly ovate, rounded behind and rather truncated in front ; outer lip arcuate, somewhat effuse anteriorly, its edge sharp and obscurely crenulate. Columella nearly straight, with three plaits, the posterior of which is the stoutest ; in senile examples a fourth plait is interposed between the second and

third, and a few ridges appear on the columella-callus which is thinly spread over the umbilical region.

Dimensions.—Length, 29 ; breadth, 17 ; length of aperture, 20; width, 9.

Localities.—One of the commonest fossils in the upper beds at Muddy Creek ; Jemmy's Point, Gippsland Lakes (*W. H. Gregson.*).

Has some resemblance to a small group of recent species gathering around *C. ventricosa*, Hinds, and *C. candida*, Sowerby.

11. Cancellaria semicostata. *spec. nov.* Plate x., fig. 3.

Shell minute, stout, oval ; whorls three and a half ; spire-whorls very convex ; penultimate whorl with ten thick rounded costæ, evanescent at the posterior suture. Last whorl not so ventricose as the penultimate, the first half turn with thick costæ on the median portion, becoming obsolete with the revolution of the whorl.

Aperture oval, rounded at each end ; outer lip thin, smooth within ; inner lip defined by a small chink behind the pillar ; columella, with a slight effuse base and two thick hardly elevated plaits above.

Dimensions.—Length, 3 ; breadth, 2 ; length of aperture, 2.

Locality.—Lower beds at Muddy Creek.

Doubtlessly an immature shell, but differs from the posterior whorls of any associated species.

12. Cancellaria modestina, *spec. nov.* Plate ix., fig. 4.

Shell stout, oblong-ovate ; spire short, with an obtuse apex. Ordinary whorls three, slightly convex, a little depressed at the posterior suture ; spirally grooved, and transversely obsoletely ridged, not plicate. There are about ten flatly rounded liræ, separated by linear grooves on the penultimate whorl ; rudely cancellated by the obsolete transverse threads.

Aperture ovate ; outer lip thin-edged, lirate within ; columella with three moderately stout plaits.

Dimensions.—Length, 12 ; breadth, 7 ; length of aperture, 7·5.

Locality.—Upper beds at Muddy Creek.

Bears a close resemblance to *C. purpuriformis*, Valenciennes, which has obsolete plications and stouter columella-plaits.

13. Cancellaria Etheridgei, *Johnston.* Plate ix., fig. 6.

Reference.—Proc. Roy. Soc., Tasmania, for 1879.

Shell turriculate ; whorls five, convex, slightly angled posteriorly, distinctly ribbed on posterior whorls, crossed by five angular liræ, which are obsoletely nodose at the intersections. Last whorl lirate, except on the narrow posterior slope ; ribbed for about a half turn ; the ribs gradually become less distinct with the revolution of the whorl, and on the last half turn are obsolete.

Aperture ovate; outer lip arched, thin edged, with about five strongly spiral ribs within; columella incurved, with two plaits situated high up.

Dimensions.—Length, 7 ; breadth, 3 ; length of aperture, 2·5.

Locality.—Table Cape *(R. M. Johnston !).*

14. Cancellaria caperata, *spec. nov.* Plate ix., fig. 7.

Shell small, stout, elongate-oval, ending in an obtuse pullus of one and a half smooth subglobose turns.

Whorls three and a half, excluding pullus, convex, sloping more rapidly to the posterior suture. Ornamented with rounded, depressed costæ, and with spiral threads in front of the angulation, forming crenate-nodosities at the intersection, conspicuously so on the posterior thread ; the whole surface finely transversely striated ; penultimate whorl with three strong spiral threads and a slender one at the anterior suture. Last whorl with about ten spiral liræ, costæ inconspicuous. Aperture oblong, rounded at each end, peritreme entire ; outer lip strongly lirate within ; columella with three transverse plaits.

Dimensions.—Length, 5 ; breadth, 2·5 ; length of aperture, 2.

Locality.—Blue clays, Schnapper Point.

15. Cancellaria capillata, *spec. nov.* Plate x., fig. 10.

Shell small, stout, elongate-oval, apex obtuse; whorls six, convex, lirate and slenderly costated. The spiral liræ increase in number from four on the first ordinary whorl to ten on the penultimate whorl ; and produce slight nodose-crenulations on the costæ.

Last whorl more ventricose than the preceding one, somewhat varicosely dilated here and there ; spirally lirate all over, costæ obsolete.

Aperture oblong, peritreme continuous ; outer lip, lirate within ; columella with two small transverse plaits.

Dimensions.—Length, 6 ; breadth, 3 ; length of aperture, 2·5.

Locality.—Lower beds at Muddy Creek.

16. Cancellaria micra, *spec. nov.* Plate x., fig. 8.

Resembles *C. capillata*, but the costæ are much arcuate and thin, the spiral threads fewer (seven on the penultimate whorl), the whorls a little flattened posteriorly, and the outer lip is smooth within.

Dimensions.—Length, 3·5 ; breadth, 1·75 ; length of aperture, 1·5.

Locality.—Clayey green-sands, Adelaide-bore.

FAMILY TEREBRIDÆ.

Genus Terebra.

SYNOPSIS OF THE SPECIES.

Shell with a smooth band in front of suture, defined by a sulcus.
1. *T. platyspira.*

Shell with a tuberculate or plicate band in front of suture, defined by a constriction.

A double row of nodulations on posterior half of whorl.

The rows of nodulations separated by a sculptured area.
2. *T. catenifera.*

The rows of nodulations contiguous.
3. *T. subcatenifera.*

Transversely plicate on posterior whorls; anterior ones smooth. 4. *T. mitrellæformis.*

Whorls varicosely costated. 5. *T. crassa.*

Costæ bent, subnodulose. 6. *T. geniculata.*

Transversely plicate throughout.

Narrowly cylindrical; pullus large, sub-globose.
7. *T. mutica.*

Broadly pyramidal; plicæ stout. 8. *T. subspectabilis.*

Narrowly pyramidal; plicæ slender; pullus cylindric.
11. *T. additoides.*

Shell without an ante-sutural band on the anterior whorls.

Transversely striated or wrinkled.

Posterior whorls flat; spire regular.
9. *T. simplex.*

Posterior whorls sub-angulated; spire acuminate.
10. *T. angulosa.*

Slenderly costated.

Anterior whorls sloping to the posterior suture.
11. *T. additoides.*

Whorls flat; ribs obsolete on anterior whorls.
12. *T. leptospira.*

Whorls convex, coronated at the suture.
13. *T. convexiuscula.*

SPURIOUS SPECIES.

Terebra scalaris, *Tate*, is transferred to *Cerithiopsis.*

1. Terebra platyspira, *Tate.* Plate viii., fig. 12.

Reference.—Southern Science Record, January, 1886, p. 6.

Shell narrow-elongate, of many flat whorls of slow increase, terminating in a relatively large papillary pullus of two turns; the first turn of the pullus subglobose, with the tip reverted and immersed, much broader than the next two or three whorls.

Ordinary whorls flat, separated by a slightly excavated suture, and having a linear spiral sulcus at the posterior-fourth; ornamented with transverse curvilinear flat ridges or wrinkles, and a few spiral flat threads medially and linear grooves near the anterior suture; the spiral ornament is only conspicuously developed on the anterior whorls of larger examples. The first five spire-whorls faintly costated.

Dimensions of figured specimen of 25 whorls:—Length, 47; width of last whorl, 6. The largest examples attain to 60 mills. in length.

Locality.—Lower beds at Muddy Creek.

This is very distinct from any living species.

2. Terebra catenifera, *Tate.* Plate viii., fig. 14.

Reference.—Southern Science Record, January, 1886, p. 5.

Shell pyramidal, elongate, of many polished whorls, ending in a papillary pullus of two rather large, smooth, convex turns.

Whorls convexly flattened, slightly overlapping; double banded and nodulose in front of the suture, the posterior band rather the broader, and separated by a shallow sulcus, in the centre of which winds a subangular ridge defined by linear grooves; about twenty pairs of nodulations on the penultimate whorl; anterior half of each whorl distantly and superficially spirally ridged; the whole surface arcuately striated by lines of growth; base spirally ridged and transversely wrinkled.

Dimensions.—Length of 17 whorls, 38; breadth of last whorl, 7.

Locality.—A common fossil in the upper beds at Muddy Creek.

It has much resemblance to the Japanese species, *T. serotina*, Adams & Reeve.

3. Terebra subcatenifera, *spec. nov.**

Shell similar to *T. catenifera*, but the double row of nodulations, which are very much larger, are separated by a linear furrow; the anterior half of each whorl is sculptured with four equidistant spiral grooves separated by much wider flat ridges; a more or less distinct transverse angular ridge is decurrent from each tubercle of the anterior row to the anterior suture.

Dimensions.—Length of 15 whorls, 25; width of last whorl, 5·5.

Localities. — Cunninghame and Jemmy's Point, Gippsland *(W. H. Gregson!).*

4. Terebra mitrellæformis, *Tate.* Plate ix., fig. 10.

Reference.—Southern Science Record, January, 1886, p. 7.

Shell cylindrically subulate, polished; whorls convex; upper whorls distinctly costated, interrupted near the suture by a

*A figure is postponed to Part III.

narrow sulcus, otherwise smooth. The plications are slightly arcuate and attenuated above and below; becoming almost obsolete on the anterior whorls.

Dimensions.—Eight whorls in a length of 9 mill.; breadth of last whorl, 2·5.

Locality.—Oyster-beds of the Upper Aldinga Series, Aldinga Bay.

The specific name of this fossil indicates its resemblance to Mitrella of the Columbellidæ; amongst species of which it comes near to *M. Lincolnensis*, but apart from the different characters of the aperture, the fossil shell is more slender than juvenile specimens of the living Mitrella. In respect to shape and ornament *T. mitrellæformis* would seem to approach to *T. nana*, Deshayes, inhabiting off the mouth of the Indus, but that species is without a sutural band.

5. Terebra crassa, *Tate.* Plate ix., fig. 10.

Reference.—Southern Science Record, January, 1886, p. 7.

Shell subcylindrical, whorls flatly convex, slighly flattened at the suture, ornamented with thick costæ separated by narrow angular interspaces, and interrupted at the posterior-third by a narrow and deep sulcus. There are about 20 costæ on the last whorl.

Dimensions.—About 10 whorls in a length of 17 mills.; breadth of last whorl, 4·5.

Locality.—Oyster beds of the Upper Aldinga Series, Aldinga Bay, South Australia.

This species bears a resemblance to some varieties of *T. dislocata* (Say), but it is narrower and more coarsely ornamented.

6. Terebra geniculata, *Tate.* Plate ix., fig. 8.

Reference.—Southern Science Record, January, 1886, p. 6.

Shell cylindrical, many-whorled, polished; pullus subacute of three small convex turns; whorls convex or subangulate; constricted around the posterior part, between which and the suture there is a row of tubercles (about twelve on the last whorl); the rest of the whorl is ornamented with distant varicose ribs, the interstices being spirally striated and faintly marked with lines of growth.

The ribs are stout, subcompressed, and abruptly bent and subnodose on the angle of the whorl; they are confluent with and equal in number to the tuberculations on the band next the suture.

Dimensions.—Length of 13 whorls, 12; breadth of last whorl, 3.

Locality.—Upper beds at Muddy Creek.

The narrow tuberculose band and the geniculate varicose costæ distinguish this species.

7. Terebra mutica, *spec. nov.* Plate x., fig. 1.

Shell small, narrowly cylindrical, ending in a relatively large subglobose pullus of one and a half turns. Ordinary whorls six and a half, flatly convex, separated by an impressed suture, transversely plicate.

Plicæ stout, slightly arched, subnodulose near the suture, interrupted in the posterior-third or so by a broad shallow constriction, there are about 20 on the penultimate whorl; axial furrows obscurely longitudinally striated; base smooth.

This species has some resemblance to the young of *T. additoides*, but is much narrower, has more plications and a different pullus.

Dimensions.—Length, 7; breadth of last whorl, 1·75.

Locality.—Lower beds at Muddy Creek.

8. Terebra subspectabilis, *spec. nov.* Plate ix., fig. 11.

Shell stout, rather broadly pyramidal, apex obtuse, of one and a half turns. Ordinary whorls seven, flatly convex, suture linear, transversely plicate. Plicæ stout, subangular, nearly straight, interrupted in the posterior-third by a very broad shallow constriction there are about twenty on the penultimate whorl; base obscurely spirally wrinkled.

This species differs from *T. mutica* by its shape, and from *T. additoides* by being broader, and by its stout plicæ, different pullus, and antesutural constriction.

Dimensions.—Length, 18; breadth of last whorl, 5.

Locality.—Upper beds at Muddy Creek.

9. Terebra simplex, *Tenison Woods.*

Reference.—Proc. Roy. Soc., Tasmania, for 1875, p. 21, tab. 1, fig. 1.

This species has the general form of *T. maculata*, Linnæus, but the whorls are slightly shouldered and strongly arcuately wrinkled transversely; the posterior whorls have straight, distant, angular plications. There is no infra-sutural groove, though the anterior whorls of large examples show a faint depression in the posterior-third.

Dimensions of largest examples of 15 whorls:—Length, 70; breadth of last whorl, 15 millimetres.

Localities.—Table Cape, Tasmania *(T. Woods)*; lower beds at Muddy Creek, Hamilton, Victoria *(R. T.)*.

The specific name given to this fossil is preoccupied by a Californian shell described by P. Carpenter; but as that "is very probably a minor variety of *T. variegata* (Gray)," Tryon, there is no need to apply a new designation.

10. Terebra angulosa, *spec. nov.* Plate viii., fig. 13.

Shell stout, pyramidal, with a somewhat acuminate spire ending in a papillary pullus of two turns, the extreme tip of which is sub-erect.

The three anterior whorls are flatly convex, faintly obliquely plicate; the next four whorls sub-angulate in the posterior-third, stoutly wrinkled transversely; the anterior whorls are a little swollen over the suture and obscurely depressed in the posterior-third, sigmoidally flatly wrinkled and striated transversely, and neatly and closely striated spirally.

Dimensions.—Length of 14 whorls, 53; breadth of last whorl, 12.

Locality.—Well-sinking, Murray Desert.

The shape of the whorls and the outline of the spire, if they prove constant, distinguish this species from *T. simplex.*

11. Terebra additoides, *Tenison Woods.*

Reference.—Proc. Roy. Soc. Tasmania for 1876, p. 95.

The pullus is sub-cylindrical and consists of about four narrow convex whorls. The posterior of the ordinary whorls have a narrow ante-sutural band, whilst the anterior ones are sub-angulated coincident with the constriction, all are plicated; the plicæ are very narrow, acute, slightly bent, sub-nodulose near the suture of the posterior whorls or on the angulation of the anterior ones; the interspaces between the plicæ are finely and closely reticulated.

Dimensions of specimen having 13 whorls:—Length, 24; breadth of last whorl, 5.

Localities.—Table Cape (*T. Woods* and *R. M. Johnston!*); River Murray Cliffs near Morgan.

The specific name indicates its affinity with *T. addita*, Deshayes.

12. Terebra leptospira, *spec. nov.* Plate viii., figs. 15*a-b.*

Shell slender, elongate, of many narrow whorls of slow increase, ending in a pyramidal pullus of four rapidly diminishing rounded turns.

Ordinary whorls flat, the posterior ones with straight, slender, angular plications; diminishing to stout oblique wrinkles on the anterior whorls, which are slightly depressed at the posterior one-third.

Dimensions.—Length of 17 whorls, 27; breadth of last whorl, 4.

Locality.—Lower beds at Muddy Creek.

13. Terebra convexiuscula, *spec. nov.* Plate x., fig. 4.

Shell narrowly pyramidal; whorls convex; suture distinct; transversely plicate; plicæ curved, thick, subangular, coronated at the suture, about 30 on the last whorl.

Dimensions.—Length of 9 whorls, 6; breadth of last whorl, 15.

Locality.—Upper beds at Muddy Creek.

FAMILY CASSIDIDÆ.

Genus Cassis.

SYNOPSIS OF SPECIES.

Shell oblong-ovate, 12 tubercles in each row in front of the last varix; posterior slope of last whorl precipitous; suture margined with granulose-crenulations. 1. *C. exigua.*

Shell ovate, 9 tubercles in each row, posterior slope concavely sloping upwards, distantly wrinkled at the suture. 2. *C. textilis.*

SPECIES EXCLUDED.

C. sufflata, *Tenison Woods*, is tranferred to *Semicassis*.

1. Cssis exigua, *Tenison Woods.* Plate vii., fig. 13.

Reference.—Proc. Lin. Soc., N.S. Wales, vol. iv., p. 17, tab. 2, fig. 7 (1879).

Shell stout, oblong-ovate, ventricose, with a very short conic spire, ending in a small pullus of one and a half smooth swollen turns, with the tip reverted and immersed. Whorls five, excluding pullus, variced at successive intervals of about two-thirds of a whorl, the first whorl transversely corrugate and spirally striate; sutures granulosely marginate.

Last whorl with a very high back, somewhat precipitous over the suture; bearing on the angle a row of 12 compressed sharp-pointed tubercles, and on the medial portion two other rows equidistantly placed, but of smaller size, a fourth inconspicuous row is developed on the adult shell. Base somewhat cancellated.

Aperture narrow, sinuously curved at each end; outer lip flattened, inflected, and slightly reflected, plicately dentate. Inner lip widely spreading, projecting behind as a thin plate, and terminated by the varix, over which it projects. Columella strongly dentately wrinkled throughout, as well as the anterior portion of the callous-covering.

Dimensions.—Length, 40; breadth of last whorl, 30; height, 27; length of aperture, 37; but attains to a length of 52.

Locality.—Lower beds at Muddy Creek.

It is hardly possible to recognise in the shell, which I have figured, an adult example of the very juvenile specimen which is the author's type of the species; but I have had that under examination, and have been able readily to trace it through a long series of graduating specimens.

In its adult state the species closely resembles *C. fimbriata*, recent in Southern Australia, from which it differs particularly by the spiral sculpture.

2. Cassis textilis, *Tate.* Plate vii., fig. 11.

Reference.—Trans. Roy. Soc. South Australia, vol. v., p. 45, 1882.

Shell stout, ovate, ventricose, with a short conic spire ending in a small sub-globose pullus, the tip reverted and immersed. Whorls five, excluding pullus, with varices at successive intervals of about two-thirds of a whorl, ornamented with numerous spiral threads crossed by folds of growth, wrinkled at the suture. Last whorl bearing on the superior angle a row of nine nodular tubercles, and on the medial portion two other rows equi-distantly placed, the tubercles of which are smaller, much more so are those of the anterior row. Posterior area concavely sloping backward to the suture.

Outer lip thickened, margin plain. Columellar callus dentate; columella very tortuous beneath the callus, canal recurved.

Dimensions.—Length, 45; breadth of last whorl, 32; height, 29; length of aperture, 31.

Localities.—Calciferous sandstones of the River Murray cliffs near Morgan; sand-rock, Cheltenham, Port Philip Bay. Casts presumably of this species occur in the oyster banks at Adelaide and Aldinga; in the crystalline limestone of the Bunda Cliffs of the Great Australian Bight; in the raggy limestones at Mannum on the River Murray.

This species differs in shape from the recent *C. fimbriata* and its fossil representative *C. exigua* by being more ventricose and by its longer spire. Its spiral ornamentation and triple row of tubercles further distinguish it from *C. fimbriata.*

Genus Semicassis.

synopsis of species.

Aperture not exceeding two-thirds of total length; surface of whorls spirally and longitudinally sculptured.

Whorls sub-angulate, with cancellate sculpture. 1. *S. transenna.*

Whorls convex, longitudinally costate, and spirally ribbed. 2. *S. subgranosa.*

Aperture at least two-thirds of total length; last whorl lirate or ribbed, not cancellate.

Last whorl spirally ribbed on posterior area. 3. *S. Muelleri.*

Last whorl spirally ribbed all over, three nodulose ribs. 4. *S. trinodosa.*

Last whorl costated. 5. *S. radiata.*

species unfigured.

S. sufflata, *Tenison Woods* (Cassis), Proc. Roy. Soc., Tasmania, for 1867, p. 21 (1879). Table Cape.

1. Semicassis transenna, *spec. nov.* Plate viii., fig. 2.

Shell thin, ovate, ventricose, contracted at the base; spire moderately produced, broadly conical, ending in a very small pullus of two and a half smooth, narrow, convex whorls.

Whorls four, excluding the pullus, subangulated in the posterior-third, slightly margined in front of the suture, with raised spiral threads cancellated by fine transverse equidistant threads. The spiral threads are about twelve on the penultimate whorl, the one on the angulation being the most prominent, those on the posterior slope (about five or six) being more slender than the anterior ones. The cancellation is obscure on the median portion of the last whorl, and the base is spirally flatly ridged only.

Aperture oval-oblong, obtuse behind, rounded in front; outer lip thickened, hardly ascending on the penultimate whorl; margin plain or obscurely dentately ridged. Columella-expansion erect, smooth; pillar twisted with a few slender oblique plaits.

Dimensions.—Length, 28; breadth, 17; length of aperture, 19.

Localities.—Lower beds at Muddy Creek; blue clays at Schnapper Point; calciferous sandstones, River Murray Cliffs near Morgan *(R. T.)*; Table Cape *(R. M. Johnston!)*.

This highly sculptured shell has no analogue in living creation; it is very common at Muddy Creek, and exhibits very slight variability.

2. Semicassis subgranosa, *spec. nov.* Plate vii., fig. 10.

Shell ovate, somewhat contracted at the base; spire acuminate, moderately elevated, ending in a conical pullus of three smooth convex whorls.

Whorls four, excluding pullus, moderately convex, margined at the anterior suture and bounded by an ante-sutural, concavely depressed, narrow zone. The first whorl finely lirate; the second and third encircled with about seven rows of granules which are on slightly oblique transverse folds; penultimate whorl with close-set oblique rounded costæ which are cut into granulose-crenatures by seven or eight encircling sulci.

Last whorl somewhat ventricose, sculptured with oblique costæ, which fade away at less than half way to the base, and encircling sulci which produce granulose-crenatures on the costæ, more conspicuously so on the first two costæ anterior to the sutural depression; the marginal band obscurely granulose. Aperture concealed in the only known specimen.

Dimensions.—Length, 55; breadth, 34; length of aperture, 37.

Locality.—Hard raggy-limestones, Edithburgh, Yorke's Peninsula.

This species has the shape of *S. semigranosa*, but differs by the

greater development of costæ and the less defined granular ornament, and by the last whorl being conspicuously spirally sulcated throughout.

3. Semicassis Muelleri, *spec. nov,* Plate vii., fig. 9.

Shell rather thin, globosely inflated; spire short, ending in a small pullus of one and a half, smooth, slightly swollen whorls.

Whorls four, excepting pullus, separated by an impressed suture, roundly angled medially, spirally ribbed; the posterior whorls with about four spiral ribs, tessellated by transverse threads; penultimate whorl with a stout medial ridge, two behind, one at the posterior suture, and two or three in front. The ribs are rounded, unequally disposed, incised by rather distant obliqne threads.

Last whorl ventricose, with a round shoulder, posterior to which are five spiral ribs, the medial one the strongest, the posterior one margining the suture; the ribs are crossed by sharp threads which crenulate them, but on the middle of the whorl are obsolete or continued as striæ; base with a few encircling depressed ribs.

Aperture ovately lunate; outer lip plain, reflected; columella nearly straight, medially thickened, twisted and obliquely truncated at the end, with about ten slender revolving plaits, expanded over the umbilical region.

Dimensions.—Length, 25; breadth, 20; length of aperture, 18.

Locality.—Upper beds at Muddy Creek.

This species, which resembles in miniature *S. nivea*, Brazier, but has a different ornament, is dedicated to Baron Sir F. von Mueller as a public mark of recognition of his contributions to the phytology of the Australian Tertiary Period.

4. Semicassis trinodosa, *spec. nov.* Ptate vii., fig. 12.

Shell globosely ovate, spire short, acuminate, ending in a small conical pullus of three smooth convex whorls.

Whorls four, excluding pullus, convex, with depressed spiral ridges and narrower sulci.

Last whorl ventricose, contracted at the base, sculptured with flatly rounded spiral ridges, and ornamented with three rows of tubercles, one on the rounded shoulder of the whorl, the third at about half way to the front, the second about midway between. The tubercles on the posterior row are the largest, smaller in size on the medial row, and somewhat inconspicuous on the anterior row.

Aperture lunate; outer lip very much thickened and slightly reflexed, ascending to the middle of penultimate whorl; margin smooth, except a few obscure denticles at the front; columella somewhat patulous, smooth, dentately ridged on the margin.

Dimensions.—Length, 30; breadth, 21; length of aperture, 25.
Locality.—Bairnsdale, Gippsland (*W. H. Gregson!*).

This fossil shell has the shape of *S. abbreviata*, Lamarck, recent on the west coast of Tropical America, from which it differs by the three subdistant rows of tubercles and its smooth inner lip.

5. Semicassis radiata, *spec nov.* Plate viii., fig. 3.

Shell globosely ovate, spire of moderate length, acuminate, ending in a small pullus of one and a half smooth convex whorls.

Whorls four, excluding pullus, convex, but interrupted by a broadish concave depression in front of the marginal rib at the anterior suture.

Posterior whorls ornamented by straight, rather crowded, slender costæ, which terminate behind at the ante-sutural depression.

Last whorl ventricose, contracted at the base, and concavely depressed in front of the suture, from which it is separated by a nodosely-crenulated band; ante-sutural zone with three or four spiral threads. Median portion ornamented with angular, slightly elevated, moderately curved costæ (about 24); at first slender and crowded, but become stronger and more widely separated with the revolution of the whorl, and are absent in the last-fourth. The costæ are interrupted on the shoulder by three inconspicuous angulations; otherwise the surface anterior to the sutural zone is without spiral ornament, except some obscure lines at the base.

Aperture ovate; outer lip thickened, margin plain, slightly ascending on the penultimate whorl. Columella convex, its surface without granulations, with fine slender revolving plaits; a small tubercle at the posterior angle of the aperture.

Dimensions.—Length, 23; breadth, 15; length of aperture, 18.
Locality.—In a well sinking, Murray Desert.

This species approaches the nodulate variety of *S. torquata*, Reeve, recent in temperate waters of Australia; but it differs by its finer ornamentation, more developed costæ, shorter spire, more tumid body whorl, by the presence of slender threads on the ante-sutural band, and by its smooth outer lip.

Genus Cassidaria.

synopsis of species.

Whorls sharply gradated, unequally and distantly lirate; keels on body whorl with crenate tubercles. 1. *C. gradata.*
Whorls angular, regularly lirate; keels on body whorl with transverse tubercles; less ventricose. 2. *C. Wilsoni.*

1. Cassidaria gradata, *spec. nov.* Plate viii., fig. 1.

Shell thin, shining, pyramidally ovate, with a moderately elongated scalar spire, ending in a small subacute pullus of one and a half turns. Ordinary whorls five; first whorl slightly convex, lirate; the succeeding whorls rapidly increasing to the sharply gradated outline of the penultimate whorl. The angulation is medial, and cut into sharp serratures, which terminate oblique obscure ridges proceeding from the suture; surface sculptured with raised truncate threads, inequidistant and unequal, separated by broad flat interspaces, from three to five above and below the serrated keel; the threads rendered obscurely granulose-crenate by transverse growth lines.

Some specimens show an angular spiral ridge at the anterior suture, but is variable in the degree of its development.

Last whorl with from four to five spiral keels on the median portion; the posterior one, at the angulation, with angular nodulations (about 20), the others are angular or somewhat truncated, and bear sharp tubercles, diminishing in size towards the front; interspaces concavely depressed with a few spiral threads and transverse distant striæ.

Base of whorl with spiral ridges; canal long, nearly closed, abruptly bent and reverted.

Aperture oblong; outer lip thickened with two or three elongate denticles at the front; inner lip corrugated.

Dimensions.—Length, 40; breadth, 30; length of aperture to the canal, 25.

Localities.—Lower beds at Muddy Creek; calciferous-sandstones, River Murray Cliffs; blue clays at Schnapper Point.

2 Cassidaria Wilsoni, *spec. nov.* Plate vii., fig. 14

Whorls sub-gradated, margined at the suture; medially angular, cancellated. Last whorl with four obtuse ridges, bearing small transversely elongated tubercles (about 30), becoming increasingly inconspicuous anteriorly; whole surface sculptured with fine equi-distant spiral threads and regular growth lines, the posterior slope being neatly and conspicuously fenestrated.

Dimensions.—Length, 27; breadth, 17; length of aperture to canal, 19.

Locality.—Spring Creek, near Geelong *(J. B. Wilson!)*.

FAMILY STROMBIDÆ.

Genus Struthiolaria.

1. Struthiolaria lirata, *spec. nov.* Plate x., fig. 11.

Shell turbinately oval, sub-globose; whorls four and a half, those of the spire moderately convex; ornamented by strong, equi-distant, depressed liræ, becoming more slender posteriorly;

a little narrower than the flat intervening sulci ; liræ about ten to twelve on the penultimate whorl.

Last whorl sub-quadrately rounded, shortly and broadly attenuated at the base ; equi-distantly lirate, with a thread and a few striæ in the interstitial spaces, obscurely marked with sigmoidal transverse striæ.

Aperture quadrately oval ; outer lip much thickened ; siphonal notch very short and narrow, not interrupting the outer rim of the lip.

Dimensions.—Length, 15·5; breadth, 12; length of aperture, 9.

Locality.—Jemmy's Point, Gippsland Lakes *(W. H. Greyson !)*

The well-rounded whorls, not sulcated at the suture, and the simple lirate sculpture distinguish this species from all known congeneric forms either recent or fossil ; this is the first record of the genus as a constituent of the Cainozoic fauna of Australia.

Genus Pelicaria.

Of this genus, allied to *Struthiolaria*, having its head-quarters in the seas of New Zealand, only two species are known, namely, *P. scutulata* (Martyn), which inhabits the coast of New South Wales, and *S. mirabilis* (Smith), of the Kerguelen Islands. *Pelicaria* differs from *Struthiolaria*, chiefly in the enamel-covered spire of the adult shell, and the thin sinuous outer lip. The two fossil species, now to be described, do not differ in any striking manner from *P. scutulata*, but both are less turreted.

synopsis of species.

Spire whorls roundly angled, with clathrate ornament.
1. *P. clathrata.*

Spire whorls angled and nodulose ; sulcate at suture.
2. *P. coronata.*

Pelicaria clathrata, *Tate.* Plate x., fig. 9.

Reference.—Southern Science Record, January, 1885, p. 2.

Shell ovate, spire acuminated, whorls six convex, suture linear or slightly impressed. Surface ornamented with numerous lamelliform rugæ, becoming confluent by twos and threes or more at the anterior-third to form ridges, and by spiral threads abont ten in number. Last whorl quadrate, depressed in the medial part, with a row of small acute nodulations at the shoulder, and a thickened ridge at the periphery ; ornamented with sigmoidal lamelliform rugæ and lines of growth which are cancellated by numerous longitudinal ridges. Callus-enamel spreading over the columella and body-whorl for two-thirds of its length and over-lapping on the penultimate whorl.

Dimensions.—Length and breadth of shell, 28 and 22, of aperture, 16 and 8.

Locality.—Bairnsdale, Gippsland *(W. H. Gregson !)*.

Pelicaria coronata, *Tate.* Plate x., figs. 6 and 13.

Reference.—Southern Science Record, January, 1885, p. 2.

Shell ovate, spire acute, whorls eight, angled, suture chanelled. Surface ornamented with transverse striæ and spiral ridges, and a row of small nodulations on the angle of the whorl. Last whorl sub-quadrate, slightly depressed in the middle line; angle without nodulations and separated from the suture by a broad and deep groove. Callus-enamel spreading over the whole of the body-whorl and the anterior-half of the penultimate whorl.

Dimensions.—Length and breadth of shell, 45 and 32; of aperture 23 and 14.

Localities.—Upper beds at Muddy Creek *(J. Dennant)*; Gippsland beds at Cunninghame, Jemmy's Point, and Reeve's River *(W. H. Gregson !)*; well-sinking, Murrray Desert *(R. T.)*.

Of the two fossil species, *P. coronata* makes the nearest approach to *P. scutulata*, but it has a shorter spire, nodulate rather than crenate on the keel, whilst the canaliculate suture of the body-whorl is very distinctive.

EXPLANATION OF PLATES II. TO X.

N.B.—The figures are of the natural size, except when otherwise stated.

Plate II.

1. Voluta sarissa, *Tate.* Muddy Creek. *a*. Perfect shell; *b*, apex enlarged.
2. Voluta McCoyii, *Woods.* Muddy Creek.
3. Voluta capitata, *Tate.* Murray Desert. *a*, Dorsal aspect of entire shell; *b*, apex enlarged.
4. Voluta lirata, *Johnston.* Muddy Creek.
5. Voluta Tateana, *Johnston.* Table Cape.
6. Voluta protcrhysa, *Tate.* Adelaide. *a*, Ventral aspect of mature shell; *b*, posterior portion of spire enlarged.
7. Voluta polita, *Tate.* Muddy Creek. Slightly enlarged.
8. Voluta costellifera, *Tate.* Muddy Creek.

Plate III.

1. Voluta lintea, *Tate.* River Murray Cliffs. *a*, Slightly enlarged; *b*, magnified view of ornament.
2. Voluta crassilabrum, *Tate.* Muddy Creek. *a* and *b*, Dorsal and ventral aspects slightly enlarged; *c*, magnified view of ornament.
3. Mitra Dennanti, *Tate.* Muddy Creek.
4. Lyria gemmata, *Tate.* Muddy Creek. Very slightly enlarged.

5. Voluta McDonaldi, *Tate.* Muddy Creek. An adult shell slightly reduced.
6. Fusus Gippslandicus, *Tate.* Bairnsdale.
7. Voluta ancilloides, *Tate.* Schnapper Point.
8. Voluta cribrosa, *Tate.* Aldinga.
9. Voluta Masoni, *Tate.* Muddy Creek.

PLATE IV.

1. Voluta heptagonalis, *Tate.* River Murray Cliffs. Apical portion of spire.
2. Nassa sublirella, *Tate.* Muddy Creek. Enlarged.
3. Eburnopsis aulacœssa, *Tate.* Muddy Creek. Enlarged.
4. Peristernia Murrayana, *Tate.* River Murray Cliffs. Very slightly enlarged.
5. Phos Gregsoni, *Tate.* Gippsland. Enlarged.
6. Mitra atypha, *Tate.* Muddy Creek. Enlarged.
7. Voluta heptagonalis, *Tate.* Reduced to two-thirds.
8. Mitra alokiza, *Woods.* Muddy Creek.
9. Mitra dictua, *Woods.* Murray Desert.
10. Mitra othone, *Woods.* Muddy Creek. Enlarged.
11. Mitra atractoides, *Tate.* Muddy Creek. Enlarged.
12. Mitra uniplica, *Tate.* Schnapper Point.

PLATE V.

1. Mitra varicosa, *Tate.* Adelaide. Slightly enlarged.
2. Mitra paucicostata, *Tate.* Muddy Creek. Enlarged.
3. Mitra leptalea, *Tate.* Muddy Creek. Enlarged.
4. Mitra ligata, *Tate.* Schnapper Point. Much enlarged.
5. Mitra terebræformis, *Tate.* Muddy Creek. Enlarged.
6. Mitra subcrenularis, *Tate.* Adelaide. Enlarged.
7. Voluta alticostata, *Tate* Muddy Creek.
8. Mitra escharoides, *Tate.* Muddy Creek. *a*, Enlarged; *b*, sculpture much enlarged.
9. Mitra semilævis, *Tate.* Muddy Creek. Much enlarged.
10. Mitra biornata, *Tate.* Muddy Creek. Enlarged.
11. Mitra citharelloides, *Tate.* Aldinga. Enlarged.
12. Mitra complanata, *Tate.* Adelaide. Enlarged.
13. Mitra euglypha, *Tate.* Gippsland. Enlarged.

PLATE VI.

1. Harpa tenuis, *Tate.* Muddy Creek.
2. Harpa lamellifera, *Tate.* Muddy Creek.
3. Harpa spirata, *Tate.* Schnapper Point.
4. Harpa cassinoides, *Tate.* Murrray Desert.
5. Mitra cassida, *Tate.* Muddy Creek. Enlarged.
6. Mitra sordida, *Tate.* Muddy Creek. Enlarged.
7. Harpa abbreviata, *Tate.* Muddy Creek.
8. Harpa clathrata, *Tate.* River Murray Cliffs.
9. Harpa pulligera, *Tate.* Schnapper Point.
10. Harpa sulcosa, *Tate.* Muddy Creek. Slightly enlarged.
11. Fusus henicus, *Tate.* Muddy Creek. Slightly enlarged.
12. Fasciolaria fusilla, *Tate.* Muddy Creek.
13. Ancillaria pseud-australis, *Tate.* Senile example. Murray Desert.

PLATE VII.

1. Ancillaria pseud-australis, *Tate.* Muddy Creek.
2. Ancillaria lanceolata, *Tate.* Muddy Creek.
3. Ancillaria subampliata, *Tate.* Muddy Creek.

4. Ancillaria papillata, *Tate*. Muddy Creek.
5. Ancillaria hebera, *Hutton*. River Murray Cliffs.
6. Ancillaria ligata, *Tate*. Adelaide.
7. Oliva nymphalis, *Tate*. Gippsland.
8. Ancillaria subgradata, *Tate*. Adelaide.
9. Semicassis Muelleri, *Tate*. Muddy Creek.
10. Semicassis subgranosa, *Tate*. Edithburg.
11. Cassis textilis, *Tate*. River Murray Cliffs.
12. Semicassis trinodosa, *Tate*. Gippsland.
13. Cassis exigua, *Woods*. Muddy Creek.
14. Cassidaria Wilsoni, *Tate*. Spring Creek.

Plate VIII.

1. Cassidaria gradata, *Tate*. Schnapper Point.
2. Semicassis transenna, *Tate*. Muddy Creek.
3. Semicassis radiata, *Tate*. Murray Desert.
4. Peristernia pumila, *Tate*. Adelaide. Much enlarged.
5. Mitra exilis, *Tate*. Muddy Creek. Much enlarged.
6. Oliva Adelaidensis, *Tate*. Adelaide. Enlarged.
7. Oliva angustata, *Tate*. Muddy Creek. *a*, Natural size; *b*, apex much enlarged.
8. Mitra clathurella, *Tate*. Muddy Creek. Much enlarged.
9. Cancellaria epidromiformis, *Tate*. Muddy Creek. Enlarged.
10. Cancellaria exaltata, *Tate*. Schnapper Point. Enlarged.
11. Cancellaria Wannonensis, *Tate*. Muddy Creek.
12. Terebra platyspira, *Tate*. Muddy Creek.
13. Terebra angulosa, *Tate*. Murray Desert.
14. Terebra catenifera, *Tate*. Muddy Creek. Enlarged about one and a half diameters.
15. Terebra leptospira, *Tate*. Muddy Creek. *a*, Enlarged about two diameters; *b*, apex very much enlarged.

Plate IX.

1. Voluta Mortoni, *Tate*. Young shell. Table Cape.
2. Voluta Mortoni, *Tate*. Fragment of adult; half natural size. Muddy Creek.
3. Cancellaria calvulata, *Tate*. Schnapper Point. Enlarged about two diameters.
4. Cancellaria modestina, *Tate*. Muddy Creek. Enlarged nearly three diameters.
5. Cancellaria ptychotropis, *Tate*. Aldinga. Enlarged about four diameters.
6. Cancellaria Etheridgei, *Johnston*. Table Cape. Enlarged about five diameters.
7. Cancellaria caperata, *Tate*. Schnapper Point. Enlarged about six diameters.
8. Terebra geniculata, *Tate*. Muddy Creek. Enlarged about four diameters.
9. Terebra crassa, *Tate*. Aldinga. Enlarged about two diameters.
10. Terebra mitrellæformis, *Tate*. Aldinga. Enlarged about three diameters.
11. Terebra subspectabilis, *Tate*. Muddy Creek. Enlarged about two diameters.

Plate X.

1. Terebra mutica, *Tate*. Muddy Creek. Enlarged about four diameters.
2. Mitra conoidalis, *Tate*. Muddy Creek. *a* and *b*, Dorsal and ventral aspects. Enlarged about three diameters.
3. Cancellaria semicostata, *Tate*. Muddy Creek. Enlarged about six diameters.

4. Terebra convexiuscula, *Tate*. Muddy Creek. Enlarged four diameters.
5. Ancillaria orycta, *Tate*. Gippsland. Slightly enlarged.
6. Pelicaria coronata, *Tate*. Muddy Creek. Ventral aspect.
7. Cancellaria ? alveolata, *Tate*. Muddy Creek. Enlarged about four diameters.
8. Cancellaria micra, *Tate*. Adelaide-bore. Enlarged about five diameters.
9. Pelicaria clathrata, *Tate*. Gippsland.
10. Cancellaria capillata, *Tate*. Muddy Creek. Enlarged about three diameters.
11. Struthiolaria lirata, *Tate*. Gippsland. Enlarged about two diameters.
12. Cancellaria gradata, *Tate*. Muddy Creek. Enlarged two diameters.
13. Pelicaria coronata, *Tate*. Dorsal aspect. Muddy Creek.
14. Cancellaria turriculata, *Tate*. Aldinga. Enlarged about five diameters.

W J C

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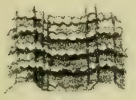

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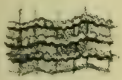

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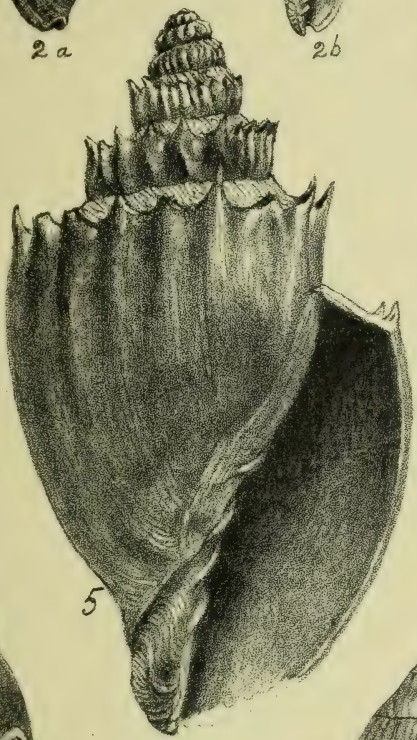

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W.J.C.

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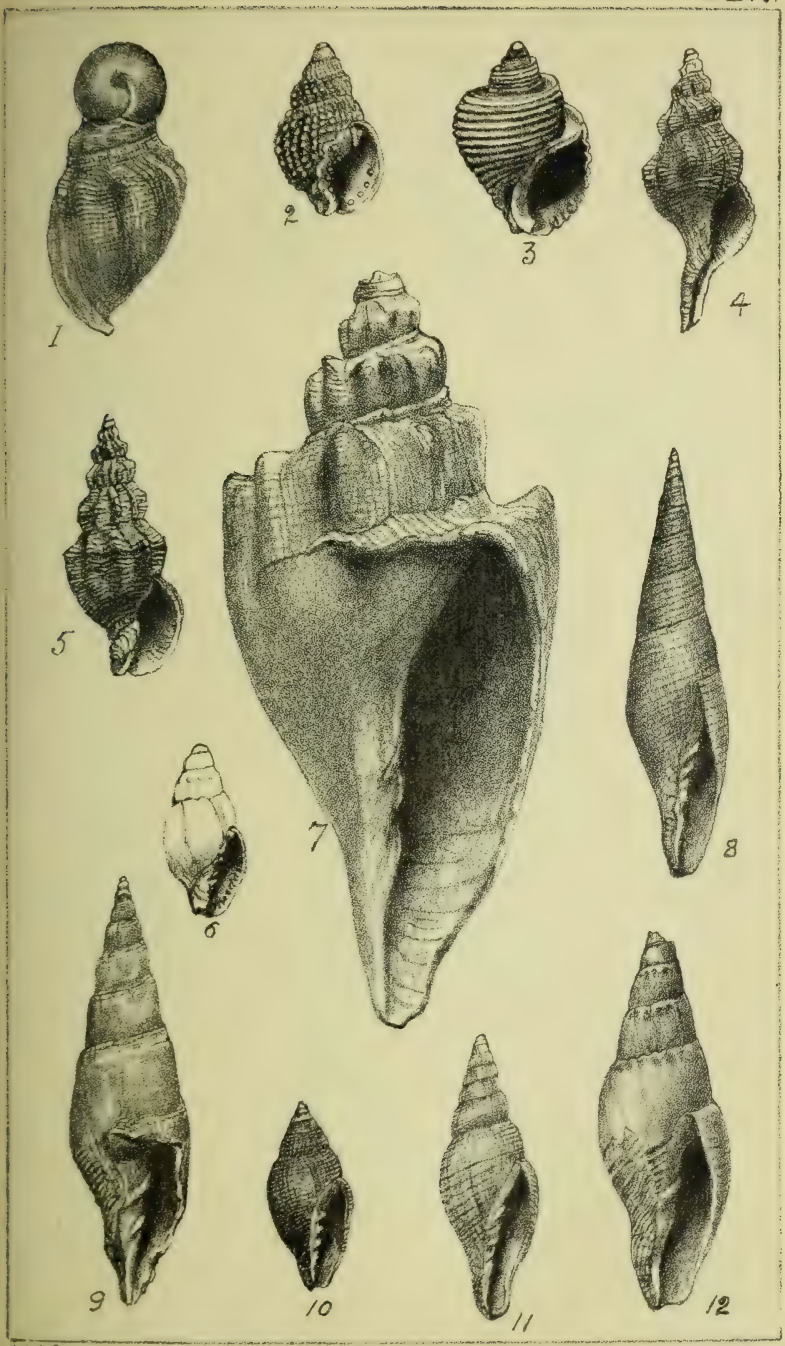
PL. IV.



N.J.C.

SHERRING & Co LITHO

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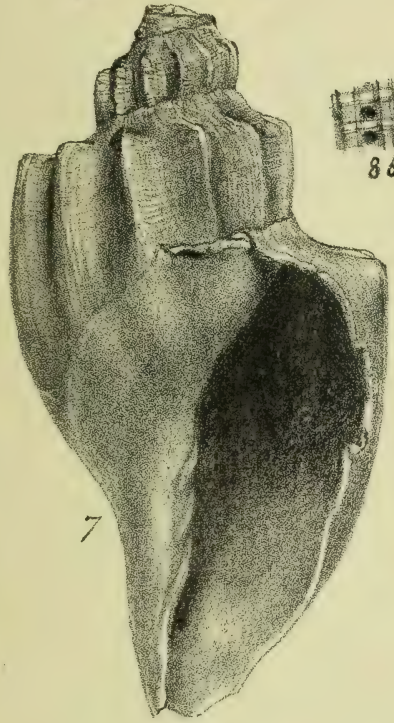
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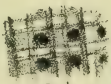
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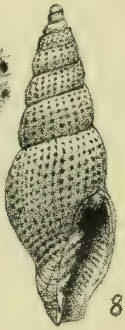
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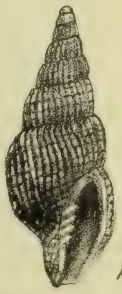
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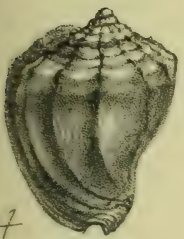
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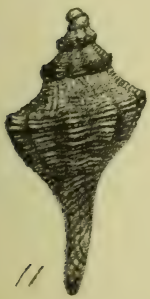
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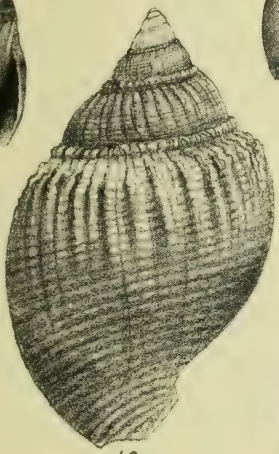
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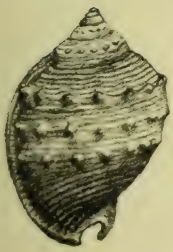
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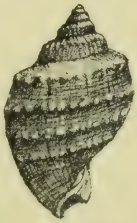
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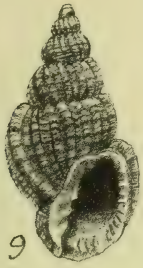
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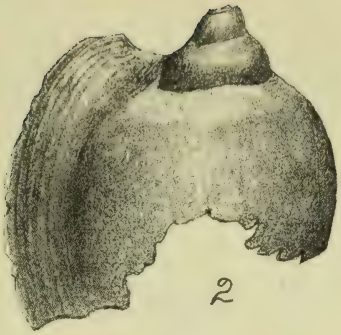

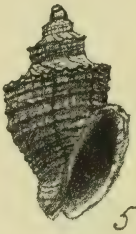

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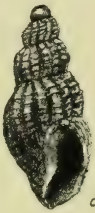
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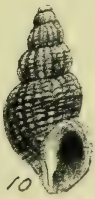
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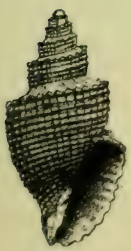
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W. J. C.

J. H. SHERRING & Co, LITHO.

Further Notes on Australian Coleoptera, with Descriptions of New Species.

By the Rev. T. Blackburn, B.A.

[Read October 2nd, 1888.]

The following paper embodies the results of some studies I have recently made among the *Phytophaga* of the sub-tribe *Galerucidæ*, and among the *Coccinellidæ* of the group called by M. Mulsant "Trichosomides."

GALERUCIDÆ.

Up to the present time, so far as I can ascertain, only one species of this sub-tribe has been actually recorded as occurring in the colony of South Australia (outside the Northern Territory), and that species (*Monolepta croceicollis*, Germ.) I do not think that I have seen. A second species (*Ellopia pedestris*, Er.) is attributed by Mr. Masters in general terms to "Australia and Tasmania," by which I suppose it is intended to imply that its range is a wide one. I have frequently met with it as far west as the Port Lincoln district, where in some localities it is rather plentiful. In the following pages I describe seven new species from South Australia proper, two from the Northern Territory, five from Western Australia, and one from New South Wales. I have been compelled to supply a new generic name for one of the South Australian species. The *Galerucidæ* appear to be much more plentiful in the northern than in the southern parts of the continent.

AGELASTICA.

Although widely different in colours and markings from any other *Agelastici* known to me, the following insect does not appear to display structural characters that call for generic distinction. It has the anterior coxal cavities open behind, the prolonged epipleuræ, the appendiculated claws, the basal joint of the hind tibiæ not longer than the following two joints together, the mucronated tibiæ, &c., as in *Agelastica*; the antennæ, however, are more slender and the prothorax less transverse than is usual in the genus.

A. lineata, sp. nov. Oblonga; supra livida, capite nigro-maculato, prothorace elytrisque lineatim nigro-notatis; subtus nigro-picea, metasterno prosterno palpis et pedibus (femoribus

piceo notatis exceptis) testaceo-lividis ; antennis piceis, articulis singulis (basali exceptâ) basi testaceis. Long. $2\frac{3}{5}$ l. ; lat., $1\frac{1}{5}$ l. (vix).

The head is entirely testaceous in front of the antennæ, the hinder part being clouded with black so as to leave only a spot above each eye testaceous. On the prothorax the dark marking takes the form of an irregular and interrupted M. On the elytra the suture is narrowly blackish, and there are also on each elytron four more or less interrupted vittæ wider than the sutural one. None of these dark markings extend into the apical sixth part of the elytra ; probably they are variable. In my example the vitta next to the suture is very much interrupted, the anterior part of the third vitta is wanting, and the hinder part of the same runs into the hinder part of the fourth. The head is finely rugulose in front, almost lævigate behind. The antennæ are about two-thirds the length of the body, and only moderately stout, much less so than in *A. melanocephala*, Baly. ; joint 1 long piriform black, 2 less than half 1, 3 about twice 2, 4 and the following joints a little longer than 3. The prothorax is about a quarter again as wide as long, slightly narrowed in front, the sides gently arched, the reflexed border rather strong, the front margin truncate or even a little convex, the base widely produced hindward behind the hind angles, the reflexed margin dilated at the front and hind angles, the former being obtuse, the latter right ; the surface rather finely and not closely punctulate, more coarsely towards the sides. The elytra are punctured about as closely as the disc of the prothorax, and scarcely so finely, having also some much finer punctures intermingled. The apex of each femur is blackish.

Taken in Western Australia by E. Meyrick, Esq.

MORPHOSPHÆRA.

It is with considerable hesitation that I refer the following species to this Malayan genus ; it ought probably to form a new genus, but as there are several already named genera of *Galerucidæ* of which I have been unable to procure descriptions, I think it better to refer the insect to an existing genus than run the risk of increasing synonymy. The examples before me agree with *Morphosphæra Sumatrana*, Jac., in having the anterior coxal cavities open behind, the antennæ short and robust, the elytral epipleuræ obsolete (or very narrow and vertical) behind the middle, the tibiæ with a short apical spine, and the claws appendiculate. The basal joint of the hind tarsi is a little longer than the following two together, but shorter than the following three. It has much the facies of a very small *Adimonia*, but with the antennæ more, and the legs somewhat less, robust It should be

added that *M. Sumatrana*, Jac., differs in important respects from *M. maculicollis*, Baly, on which the genus was founded.

M. (?) cincta, sp. nov. Oblonga ; sat robusta ; sat nitida ; fulva ; antennis (articulo 1° basi excepto), palpis, et metasterno, nigris ; tibiis intermediis posticisque, tarsis omnibus, et abdomine postice, infuscatis vel piceis ; elytris marginibus omnibus cyaneo-nigris ; capite prothoraceque subtiliter crebre, elytris minus subtiliter sat crebre, punctulatis. Long., $1\frac{3}{5}$ l. ; lat., $\frac{4}{5}$ l. (vix.)

The blue-black edging of each elytron is wider along the base and suture than on the lateral margins. The infuscation of the posterior 4 tibiæ begins a little above the middle. The antennæ are very little more than half the length of the body, robust, the first and fourth joints each equal to the other and to the second and third together, the third rather longer than the second. The head bears a very strong somewhat arched transverse furrow between the eyes. The prothorax is very little wider than long, its front angles but feebly defined, its hind angles dentiform ; it bears an extremely strong, round fovea on either side of the disc, and these are feebly connected by a shallow transverse impression. Western Australia ; sent to me by E. Meyrick, Esq.

NEORUPILIA, *gen. nov.*

Caput sat magnum ; antennæ graciles corpore vix breviores ; articulo 1° elongato, 2° 1° triplo breviori, 3° 2° duplo longiori, 4° 3° longitudine æquali ; acetabula antica postice aperta ; epipleuræ distinctæ postice obsoletæ ; tibiæ mucronatæ ; unguiculi leviter appendiculati, parvi ; metasternum breve ; elytra abdomen haud tegentia.

The metasternum not longer than the prosternum and the elytra separately rounded (or almost subtruncate obliquely) at the apex leaving the last segment and part of the penultimate exposed in one sex (in what I take to be the other sex not quite covering the antepenultimate segment) associate this insect with the group *Rupiliites* of Dr. Chapuis, but it is not closely allied structurally to any of the previously described genera of that group. The claws are very small, and seem to be slightly appendiculate ; they are certainly not bifid as in all the known *Rupiliites* except *Marseulia* in which they are simple ; perhaps they would be best described as obtusely dentate near the base.

N. viridis, sp. nov. Oblonga ; minus robusta ; sat nitida ; nigra, supra subaureo-viridis ; antennis basi, genubus, tibiis, et tarsis (apice excepto), testaceis ; capite prothoraceque sparsim subtilissime, elytris sat crebre sat crasse subsquamose, punctulatis. Long., 1 l ; lat., $\frac{1}{2}$ l.

The head bears a transverse furrow between the eyes and a longitudinal carina between the antennæ. The prothorax is not much wider than long, almost truncate in front where it is a little wider than at the base, the sides moderately arched, the front angles obscure, the hind angles subdentiform. The basal joint of the antennæ is pitchy (testaceous beneath), the second and third are dull testaceous, the rest pitchy black.

The single example which I take to be the other sex of this species, in addition to having much shorter elytra, has the antennæ more slender, and the parts of the legs and antennæ which in the type are testaceous, are much more obscure. It may possibly appertain to a distinct species.

Port Lincoln.

ELLOPIA.

E. Sloanei, sp. nov. Sat elongata, postice dilatata; subnitida; supra glabra, piceo-lurida, subcupreo-tincta; capite antice, prothoracis marginibus, tibiisque basi, dilutioribus; corpore subtus nigro; hoc cum pedibus pubescenti; coxis testaceis; capite prothoraceque leviter minus subtiliter punctulatis; elytris coriaceis vix perspicue punctulatis, singulis longitudinaliter profunde bisulcatis. Long., $3\frac{2}{5}$ l; lat., $1\frac{4}{5}$ l.

This remarkable species agrees perfectly with *Ellopia pedestris*, Er., (which appears to be widely distributed in South Australia) in all structural characters, but is widely different specifically. The two deep furrows abbreviated at both ends running down the inner half of each elytron are a very distinctive character; in some (perhaps most) examples there are traces of a much feebler sulcus at no great distance from the lateral margin. The antennæ are a little less robust than in *E. pedestris;* in some examples (as appears also the case in *E. pedestris*) the second joint is less abbreviated than in others: I believe this to be sexual and that the second joint is elongated in the females.

Mulwala (N.S.W.); taken by Mr. T. G. Sloane and courteously supplied to me.

CANDEZEA.

C. Palmerstoni, spec. nov. Sat late oblonga; sat nitida; nigra; capite (labro, palpis, et antennis apicem versus exceptis), prothorace et elytris, testaceis; pedibus pallidis, minus picescentibus; capite prothoraceque subtilissime sat sparsim, elytris minus subtiliter minus sparsim, punctulatis. Long, $2\frac{4}{5}$ l; lat., $1\frac{2}{5}$ l.

The elytra in some examples are vaguely clouded with infuscation in the hinder half. Head with a straight transverse furrow between the eyes. Antennæ about half as long as the body,

rather slender, the basal three joints testaceous, the rest dark piceous or black, joints 1 and 4 about equal to each other, and each about equal to 2 and 3 together, 3 longer than 2. Prothorax scarcely half as wide as the greatest width of the elytra, about half again as wide as long, moderately narrowed to the front, its angles a little thickened (the anterior nearly right, the posterior obtuse), narrowed and widely produced hindward behind the hind angles, the front almost truncate. Elytral epipleuræ very well defined almost to the apex. Basal joint of hind tarsi longer than the following three together. Claws appendiculate. All the tibia mucronate. Anterior coxal cavities closed.

I think there is no doubt of the correctness of the reference of this species to *Candezea* (not previously recorded as Australian); at any rate this species and the following appear to be congeneric with *C. bimaculata*, Jac., from New Guinea, which their author attributes to the genus.

Northern Territory of South Australia; taken by Dr. Bovill.

C. Bovilli, sp. nov. Sat late oblonga; sat nitida; testacea; antennis (basi exceptis) piceis; elytris (humeris exceptis) fulvo piceis; capite prothoraceque subtiliter sat crebre, elytris sat fortiter sat crebre, punctulatis. Long., $2\frac{4}{5}$ l.; lat., $1\frac{3}{5}$ l.

Each shoulder is testaceous on an area about as large as one of the eyes, and the testaceous colour is narrowly continued thence to the scutellum along the base; the suture also is vaguely stained with testaceous near the base (probably the colour of the elytra is variable). The antennæ and head scarcely differ from those of *C. Palmerstoni*, except in the latter being a little narrower; the prothorax too resembles that of the same species, but is much more closely and strongly punctulate, with the angles more defined and thickened; the puncturation of the elytra too is much stronger. There is a vague depression on either side of the disc of the prothorax.

Northern Territory of South Australia; a single specimen taken by Dr. Bovill.

MONOLEPTA.

M. angulata, sp. nov. Oblonga; sat nitida; piceo-nigra; antennarum basi, ore, capite subtus postice, prosterno medio, pedibusque testaceis; capite supra postice, prothorace basi, scutello et elytris gutta humerali fasciaque angulata ante medium, flavo-rufis; capite sparsim subtilissime, prothorace subtiliter minus sparsim, elytris fortius minus sparsim, punctulatis. Long., $1\frac{4}{5}$ l.; lat. $\frac{4}{5}$ l.

A furrow runs across the head between the eyes, curving for-

ward. The prothorax is half again as wide as long, its front almost truncate, its front angles feeble, its sides gently arched, its hind angles sub-dentiform, its surface even. The antennæ are about two-thirds the length of the body, moderately slender, the basal three joints testaceous, joints 1 and 4 about equal to each other, and each about equal to 2 and 3 together, the latter two not differing much from each other in length. The epipleuræ of the elytra though very narrow and obscure behind the middle do not appear to be absolutely non-existent. The tibiæ are finely mucronated, the anterior coxal cavities closed. The claws are appendiculated. The basal joint of the hind tibiæ equals in length the following three together.

Port Lincoln ; not uncommon.

M. fasciatipennis, sp. nov. Oblonga ; sat nitida ; testacea ; antennis (basi apiceque exceptis) femoribus basi et (nonnullis exemplis) tibiis, infuscatis vel piceis ; prothorace antice (nonnullis exemplis) et elytris totis (fascia angulata mediana excepta), nigris ; capite sparsim subtiliter, prothorace elytrisque minus sparsim minus subtiliter, punctulatis. Long., $1\frac{4}{5}$ l. ; lat., $\frac{4}{5}$ l.

The puncturation is in general a little less strong and less sparing ; apart from this difference and its very different pattern and arrangement of colors, the present species scarcely differs from the preceding. Regarding the ground color of the elytra as black, the red fascia is much wider and less conspicuously angulated than that of *M. angulata ;* this fascia is so placed that its hind margin is slightly behind the middle of the elytra. I can find no structural distinction except that the epipleuræ are even more obscure behind the middle, but still not entirely wanting ; if carefuliy examined under a powerful lens the elytra are seen to end laterally in (not a single sharp edge like that of a knife blade but) two very fine edges parallel to, and apparently in contact with, each other.

Interior of South Austrslia ; basin of Lake Eyre.

M. dirisa, sp. nov. Oblonga ; sat nitida ; testacea ; antennis (basi excepta), palpis, elytris parte dimidia apicali, et abdomine, piceis vel nigris ; tarsis supra plus minus infuscatis ; capite prothoraceque vix perspicue, elytris subtilius minus crebre, punctulatis. Long., $1\frac{3}{5}$ l. ; lat., $\frac{7}{10}$ l.

The sculpture and proportions of the several parts do not seem to differ noticeably from the same in *M. angulata*, except as follows, viz. : The prothorax is punctured only very obscurely, and for the most part only near the margins, and it has an ill-defined transverse depression (in some examples interrupted near the middle) across the disc ; the elytra are punctured much more finely

and more confusedly (*i.e.*, with punctures still smaller scattered among the prevalent punctures); and the epipleuræ are still less distinct, the two fine lines (that in the hind half of the elytra represent what in front are the two margins of the epipleuræ) both running close before the lateral edge of the upper surface of the elytra; thus the epipleuræ in the hinder part are vertical and excessively narrow, and if they be sought by looking down upon the *under surface* of the insect they cannot be seen at all.

Sedan (South Australia); taken by Mr. B. S Rothe.

M. inconspicua, sp. nov. Oblonga; sat nitida; fusca, subtus obscurior, antennis apicem versus picescentibus: capite vix perspicue, prothorace subtilius sat sparsim, elytris crassius sat leviter sat crebre, punctulatis. Long., $1\frac{2}{5}$ l.; lat., $\frac{3}{5}$ l.

Compared with *M. angulata*, the antennæ are evidently shorter and the prothorax is more transverse (about twice as wide as long), with the posterior angles less dentiform. The puncturation is not much different from that of *M. angulata*, but seems to be a little less strongly impressed. The epipleuræ are like those of *M. divisa*. The other structural characters seemed to be identical with those of the preceding three species.

An example with long slender antennæ (not much shorter than the body) of which the 3rd joint is evidently longer than the 2nd, may perhaps be the other sex of this insect.

Port Lincoln.

M. Meyricki, sp. nov. Oblongo-ovatus; niger, prothorace, femoribus, tibiis (his apice excepto), et antennarum articulis basalibus 3 (parte apicali picea excepta), testaceis; elytris nigrocyaneis; his crebre minus fortiter rugulose punctulatis; subtus parce pubescens; epipleuris mox pone medium obsoletis. Long., $2\frac{2}{5}$ l.; lat., $1\frac{1}{5}$ l.

A well-marked curved furrow runs across from eye to eye on the head, which is longitudinally carinate down the middle of the anterior portion, and is scarcely distinctly punctulate in any part. The antennæ are about three-quarters the length of the body. The prothorax is in outline and puncturation scarcely different from that of *Agelastica lineata*, except in being slightly more transverse; it differs in the absence of markings and in the presence across the centre of an ill-defined but wide and deep transverse furrow, which is almost interrupted at its middle. The puncturation of the elytra is rugulose, rather strong, and very close.

A single specimen was sent to me from Western Australia by E. Meyrick, Esq.

M. occidentalis, sp. nov. Oblongo-ovatus; niger, capite (vertice summo excepto), prothorace, antennarum basi, pedibusque testaceis; elytris viridibus; his subtiliter minus crebre haud rugulose punctulatis; subtus parce pubescens; epipleuris apicem fere attingentibus. Long., $2\frac{1}{5}$ l.; lat. 1 l.

The sculpture of the head does not differ noticeably from the same in *M. Meyricki*, and the antennæ scarcely differ except in having the basal three joints testaceous and the fourth fuscous. The prothorax is nearly twice as wide as long, and has the angles less prominent and thickened than in *M. Meyricki*, but otherwise is very similar. The puncturation of the elytra is much less close and a little less strong than in that insect.

Western Australia; taken by E. Meyrick, Esq.

M. modesta, sp. nov. Oblonga; capite abdomineque nigris, prothorace pedibusque rufo-testaceis, elytris viridi-nigris, antennis palpisque fuscis; elytris sat crasse sat crebre squamose punctulatis; subtus parce pubescens; epipleuris apicem versus anguste continuatis. Long., $1\frac{3}{5}$ l.; lat., $\frac{3}{5}$ l.

Var. Corpus plus minus obscurum fere usque ad totum nigrum.

As regards colour, I have seldom seen a more variable species than this; all the parts that are not black or greenish-black in the type appear liable to be so exceptionally, except the tibiæ (which are more or less testaceous in all the examples I have seen) and the tarsi, which do not seem to get beyond dark brown. The head does not differ notably from that of *M. occidentalis*, except in having the furrow between the eyes angulated in the middle; the prothorax, too, is similar in proportions and outline, except that its front margin is equal to (not as in *M. occidentalis* a little narrower than) the base; it is, however, much more sparingly punctured, and has no transverse depression across the middle. The elytra are rather coarsely and squamosely, but not closely, punctured; compared with those of *Luperus flavipes*, Linn. (which this insect somewhat resembles), they are more coarsely and squamosely punctulate; they are considerably narrowed at the apex. The third joint of the antennæ is very little longer than second, the fourth equals the second and third together, and is a little longer than the fifth. The elytral epipleuræ are very narrow, but can be traced to near the apex. All the tibiæ are mucronated.

Monolepta croceicollis, Germ., must be much like some varieties of this insect in respect of size and colours, but *inter alia* that species is said to have the third and fourth joints of the antennæ "subequal."

Common near Port Lincoln. I have not seen it from other localities.

M. simulatrix, sp. nov. Oblonga; sat nitida; fusca; tarsis obscurioribus; antennis (basi excepta) nigris; capite prothoraceque sparsim subtiliter, elytris minus subtiliter minus sparsim, punctulatis. Long., 2 l.; lat., 1 l. (vix).

Very like *M. inconspicua*, but larger, and with longer antennæ, which, however, are shorter than those of the specimen mentioned above as possibly the male of that species. The antennæ, moreover, are wholly black, excepting the basal three joints, while in *M. inconspicua* the joints beyond the third are only near their apex, of a darker shade of fuscous than at their base; joints 2 and 3 are about equal to each other, and (together) both to joint 1 and joint 4. The puncturation of the elytra is evidently finer and a little closer than in *M. inconspicua*.

Sent to me from Western Australia by E. Meyrick, Esq.

M. (?) *quæsita*, sp. nov. Oblonga; sat nitida; æneo-nigra; antennis piceis basi testaceis; pedibus anticis (femoribus basi piceis exceptis) testaceis, intermediis (femoribus apice tibiisque basi testeceis exceptis) et posticis piceis; capite vix perspicue, prothorace subtilius crebrius, elytris crassis, punctulatis. Long., $1\frac{2}{5}$ l.; lat., $\frac{3}{5}$ l.

I unfortunately possess only a single example of this insect, and it has dried in a position in which I cannot see the structure of the anterior coxal cavities as distinctly as I could wish, but I am almost certain that they are closed behind. I have, however, placed this doubt on record by the note of interrogation above. The species bears much general resemblance to a darkly-coloured example of *Monolepta modesta*, differing, however, in its antennæ, which (in one sex at least) are scarcely shorter than the body, having the basal joint evidently longer than any of the following three, the second less than half the length of the first, the third a little longer than the second and only a little shorter than the fourth; the basal four joints testaceous, the rest piceous. The head and prothorax are like those of *M. modesta*, but the latter is proportionally smaller. The epipleuræ of the elytra are better developed behind the middle than in the other species of *Monolepta* described above.

Port Lincoln.

COCCINELLIDÆ.

The species treated of in this paper belong to the group of *Coccinellidæ*, called by M. Mulsant *Trichosomidæ*. The number of new species I have to add—all, or nearly all, of them occurring in the southern part of this colony—are more than the entire number previously known from the whole of Australia; from which it will appear that this group of insects presents a very inviting field for the researches of the Australian naturalist.

In Mr. Masters' "Catalogue of the described *Coleoptera* of Australia" there are twenty-two species belonging to this group recorded, but besides there are seven others that appear to have been accidently omitted from the catalogue, making a total (so far as I have been able to ascertain) of twenty-nine.

The *Trichosomidæ* of Mulsant contains a group, *Epilachnides*, which Dr. Chapuis has since, apparently with good reason, elevated to the rank of a principal division of the *Coccinellidæ*. If the Australian *Epilachnides* be abstracted, the number of species of true *Coccinellidæ* of the pubescent group hitherto recorded as occurring on the continent is reduced to twenty-two. I do not think that the division of the family into a pubescent and a non-pubescent group is altogether natural, but as it happens accidently that my present paper has to do only with the former (owing to my having no new species of the latter before me), it will be convenient to my present purpose by accepting that division to avoid having to distinguish the new genera and species before me from any of the non-pubescent group.

Dr Erichsen was the first to describe Australian insects of this group. In his "Beitrag zur Insecten-Fauna von Vandiemensland" (1842) he describes three species as members of the genus *Scymnus*. In 1851 M. Mulsant, in his great work, "Species des Coléoptéres *Trimères sécuripalpes*," characterised seven additional species apportioned among three genera, and in a supplement to the same, two years later, added four more. In 1859 M. Bohemann described an additional species; in 1874 Mr. Crotch (in his "Revision of the Coccinellidæ") another six, and finally in 1876 Dr. Chapuis (Gen. Col. xii.) one more still. Of these, two are attributed by their author to our own colony, one is stated to be from New South Wales, one from Victoria, one from Western Australia, while three are Tasmanian, and seven come from Queensland, the remainder being vaguely set down as inhabiting "Australia."

The Australian *Coccinellidæ* that have received names have been more fortunate than many of our *Coleoptera* in having been intelligibly described, and there are comparatively few whose identification is attended with much uncertainty; I trust that I may prove to have maintained this excellent character for the group in the descriptions that I now offer to the Society.

The principal difficulty that I have encountered in dealing with the following species has been their apportionment into genera. I am of opinion that a large number of new generic names will be eventually required for the Australian pubescent *Coccinellidæ*, but I do not think that the work of providing them is one that it would be wise for a student resident in Australia to undertake. Such contributions to science, if they are to be of permanent (or

perhaps I should say of *any*) value must have regard to more than local fauna, and can hardly be made profitably by any who have not access to the vast collections that are stored in the great museums of Europe. Recognising this fact I have adopted the principle of referring the new species I have to describe to existing genera wherever it is at all possible to do so, adding as full information as I can give of the characters that render their position in those genera only provisional. I propose new generic names only for insects which would be so out of place in known genera that their location there would be likely to mislead. Accordingly it will be found that I have attributed by far the larger number of the Coleoptera described to the genera *Scymnus* and *Rhizobius*, although some, at least, of them can hardly be considered truly congeneric with European types.

To *Scymnus* I have referred all the species before me presenting the following combination of characters:—Eyes neither coarsely granulated nor oblique in position; antennæ short, of not less than ten joints;* epipleuræ devoid of well-defined foveæ; prosternum not provided with a prolongation covering the mouth organs in repose, mesosternum not carinate longitudinally; suture between the first and second ventral segments, obliterated (or at least much enfeebled) in the middle; claws appendiculate; base of antennæ exposed.

All the species I have attributed to *Scymnus* correspond with the above formula, with the exception of the last, which differs in specified respects. Were it not for that species I might add to the formula "abdominal lamellæ incomplete." In some respects (especially the structure of the prosternum) the insects thus associated differ much *inter se*, as I have indicated by dividing them into subgeneric groups, to which, however, I have thought it better not to apply names.

The following I have treated as the essential characters of *Rhizobius*:—Eyes coarsely granulated and oblique in position; antennæ more or less long, of eleven joints; epipleuræ devoid of well-defined foveæ; prosternum not with a prolongation covering the mouth organs in repose; mesosternum not carinate longitudinally; suture between the first and second ventral segments, not noticeably enfeebled in the middle; claws appendiculate; base of antennæ exposed; tibiæ more or less slender.

The species in my hands presenting the above characters differ considerably in some respects *inter se*, enabling me to group them in sections that (unless intermediate forms be subsequently found) would seem to be of generic value.

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* I believe that in all cases they consist of eleven joints; in the case of several species, however, I have been unable to satisfy myself absolutely on the point.

Mr. Crotch (in his "Revision of the *Coccinellidæ*" 1874) points out that *Rhizobius* and its allies are distinguished from other members of the family by having the anterior coxal cavities open behind. This appears to be a very important observation, but unfortunately generally involves the sacrifice of a specimen for its application, so I have not been able to make full use of it, but, so far as I have been able to ascertain, the species I have referred to *Rhizobius* present the character in question.

For five species I have been compelled, with great reluctance, to propose five new generic names; they all possess strongly marked characters that are quite incompatible with those of any genus I can ascertain to have been previously named.

The remaining three species I have attributed to *Eupalea* (with extreme doubt) and *Novius*.

Of the remaining five genera already attributed to Australia, *Hypoceras*, *Platyomus*, and *Pharus* are known to me only by description; the first has the epistoma emarginate and the antennæ only eight-jointed; the second has the mesosternum carinate; and the third has the base of the antennæ concealed, together with epipleuræ devoid of well-defined foveæ. I possess types of the other two, *Cryptolæmus* (a Northern Australian form only, so far as I know, with the prosternum produced over the mouth organs in repose), and *Bucolus* (common in South Australia, having well defined epipleural foveæ, together with a moderately produced prosternum).

The following table indicates some of the distinctive characters of the Australian genera of pubescent *Coccinellidæ*:—

A. Femora not falling into excavations of the under surface.
  B. Base of antennæ not hidden behind the dilated epistoma.
    C. Epipleuræ devoid of well-defined foveæ.
      D. Antennæ formed of more than eight joints.
        E. Mesosternum not longitudinally carinate.
          F. Prosternum not produced to cover the mouth organs.
            G. Length of antennæ exceeding width of space between the eyes.
              H. Eyes very coarsely granulated. *Rhizobius.*
              HH. Eyes more or less finely granulated. *Eupalea* (?).
            GG. Length of antennæ not exceeding width of space between the eyes.
              I. Suture between first and second ventral segments enfeebled or obliterated in the middle. *Scymnus.*

II. This suture not noticeably enfeebled in the middle. *Scymnodes.*

FF. Prosternum produced to cover the mouth or gans. *Cryptolæmus.*

EE. Mesosternum carinate. *Platyomus.*

DD. Antennæ formed of only eight joints.

K. Epistoma truncate in front. *Novius.*

KK. Epistoma emarginate in front. *Hypoceras.*

CC. Epipleuræ with well defined foveæ.

L. Prosternum short. *Bucolellus.*

LL. Prosternum long. *Bucolus.*

BB. Base of the antennæ hidden behind the dilated epistoma.

M. Epipleuræ with well defined foveæ. *Lipernes.*

MM. Epipleuræ devoid of well defined foveæ. *Pharus.*

AA. Femora fitting into excavations of the under surface.

N. Tibiæ fitting into sulci on under surface of femora. *Serangium.*

NN. Femora normally sulcated. *Cyrema.*

EUPALEA.

It is with much hesitation that I attribute the following species to the tropical South American genus *Eupalea*, notwithstanding that in the supplement to his work M. Mulsant himself (the author of the genus) attributes an Australian species to it (which, however, Mr. Crotch regards as a mistake). The possession of the following characters would seem to place the insect before me in the group of *Coccinellidæ*, which Dr. Chapuis calls "Poriites," viz., base of antennæ exposed, epipleuræ not bearing well-defined foveæ, body pubescent, epistoma entire in front, antennæ long enough to reach the base of the prothorax (or nearly so), and having the apical joints elongate. From *Rhizobius* (which agrees with it in most of these respects) it differs by its finely granulated large eyes, with their inner margins subparallel.

The group *Poriites*, according to Dr. Chapuis, contains two genera—*Poria* and *Eupalea*—both inhabiting tropical America, though Dr. Chapuis alludes to M. Mulsant's Australian species, and adds that he has himself a species from Australia in his own collection.

The present insect agrees with *Eupalea* in most respects—especially in the structure of the antennæ, in the rather peculiar prosternal structure, in the sinuation of the epipleuræ opposite the hind femora, and in the small size of the abdominal lamellæ. It differs from the characters of *Eupalea* (as given by Dr. Chapuis) in the finer granulation of the eyes, which are not distinctly sinuated on their internal margin, in the not particularly small

scutellum, and in the claws. These latter are unusually small, and so bent under the last joint of the tarsi that I found them exceedingly difficult to examine. I think, however, that they are certainly appendiculate, with the inner apex of the basal piece somewhat produced, while in *Eupalea* they are said to be bifid, with the inner division short and basal. As this may be a different way of describing the same character, I do not like to found a genus on it. Nevertheless, the present insect is so much smaller and so differently coloured from the South American species, that it can only be provisionally associated with them. The intermediate and (especially) the hind coxæ are unusually widely separated—a character not mentioned as pertaining to *Eupalea*. The first ventral suture is as strongly marked as the others.

E. (?) *rotunda*, sp. nov. Sub-hemisphæricus; convexus; sat nitidus; pubescens; læte brunneus; prothoracis disco, metasterno abdomine medio, et tarsis, plus minus picescentibus; capite prothoraceque subtiliter, elytris minus subtiliter, sat crebre punctulatis. Long., 1 l.; lat., $\frac{4}{5}$ l.

The almost circular outline and clear, bright brown colour (with only the disc of the prothorax infuscate) of the upper surface of this insect render it at a glance very different from any other Australian *Coccinellid* known to me. For the sake of comparing its puncturation with that of a common species, I may say that its elytra are punctured a little, but not much, more finely than those of *Rhizobius ventralis*, Er. In one of my two examples the suture of the elytra is a little infuscate.

Port Lincoln.

NOVIUS.

N. Lindi, sp. nov. Breviter ovalis; minus convexus; nitidus; pubescens; niger; elytris macula rufa instructis; antennis, palpis, tibiis apice, et tarsis, rufopiceis; capite prothoraceque vix perspicue, elytris crebre subtilius, punctulatis. Long., 1 l.; lat., $\frac{4}{5}$ l.

Each elytron bears a well-defined oblong bright red spot, the hinder end of which reaches about the middle of the length of the elytron, and which is placed near to the suture. The head is wide; the eyes are large and finely granulated, their inner margins parallel. The prothorax is rather more than twice as wide as long down the middle, its front bisinuate, the middle being produced forward, its anterior angles little produced and narrowly rounded off, its sides gently arched and narrowed towards the base (with which they form a very obtuse angle) the latter being strongly arched backward all across and fitting into a deep common emargination of the elytra. The scutellum is triangular and

moderately large. The prosternum is extremely short, not longer than the mesosternum; between the coxæ it appears as a concave lamina scarcely longer than its width behind, with a continuous elevated margin except at its line of contact with the mesosternum, and somewhat narrowed to the front, where it is rounded. The mesosternum is much like that of *Orcus* in size and shape, but is a little more convex; its front is truncate, or almost convex. There is a well-defined sixth ventral segment, and the basal ventral suture is not less marked than the others. The epipleuræ are moderately wide and horizontal at the base, but become gradually narrower and vertical, disappearing altogether before the apex; they are not foveated. The femora and tibiæ are all strongly compressed, the former being deeply grooved for the reception of the latter. The tarsi are very stout. The abdominal lamellæ are complete, and extend back about two-thirds the length of the basal ventral segment. The prothorax is not narrower at its base than the true base of the elytra, but the latter dilate very rapidly immediately from the base, and the humeral angle is so slightly marked that until carefully examined the anterior part of the lateral margin might pass for a portion of the base.

Port Lincoln.

N. bellus, sp. nov. Breviter ovalis; minus convexus; nitidus; pubescens; niger; prothoracis dimidio apicali, elytris vittis maculisque nonnullis, antennis, epipleuris in parte, et segmentis ventralibus in parte, læte rufis; pedibus piceis, tarsis rufescentibus; capite prothoraceque vix perspicue, elytris crebre subtilius, punctulatis. Long., $1\frac{3}{10}$ l.; lat., 1 l.

A very pretty *Scymnid*, the red markings being very bright and sharply defined. On each elytron they are as follows:—(*a*) A vitta parallel and near to the suture, extending from the base about four-fifths of the distance to the apex, very wide in front and quickly narrowed (somewhat resembling a dumb bell with one of the knobs broken off); (*b*) a vitta occupying the front half of the lateral margin, and dilated at its base so as to meet the sutural vitta about the middle of the base; (*c*) a large discal spot just behind the middle; (*d*) an apical spot. The red parts of the epipleuræ correspond with the marginal and apical red portions of the upper surface. This species does not appear to differ structurally from *Lindi* in any respect, and its sculpture is very similar. Apart from the totally different coloration it is a larger and more convex insect.

Sedan; taken by Mr. B. S. Rothe.

SCYMNODES, *gen. nov.*

Caput prothoraci modice insertum; antennarum basis aperta; oculi sat magni, subtiliter granulati, intus subparalleli;

epipleuræ antice sat latæ, elytrorum in parte quarta postica obsoletæ, haud perspicue foveatæ; prosternum in medio longitudinaliter depressum (spatio depresso utrinque carinato, angusto, abasi ad apicem angustato, apice acuto); mesosternum sat magnum, antice leviter emarginatum; abdomen segmentis 6 conformatum; suturæ ventrales bene impressæ; lamellæ abdominales segmenti basalis apicem fere attingentes, integræ; tibiæ et femora sat fortiter compressæ; antennæ articulis 10 conformatæ, minus breves; corpus pubescens; unguicula appendiculata.

The insect for which I form this genus differs from nearly all hitherto described Australian pubescent *Coccinellidæ* by its antennæ of ten clearly defined joints. The basal two joints are large and dilated, 3 much narrower and rather elongate, 4 evidently shorter than 3, 5 and 6 a little shorter than 4, 7 to 9 gradually longer and wider, 10 pointed. From *Cryptolæmus*, which has very similar antennæ, it may be at once distinguished by the entirely different structure of the prosternum and claws, by the well defined sixth ventral segment, and the greater breadth of the elytral epipleuræ in front. The mesosternum is remarkably like that of *Cryptolæmus*, near which genus I think this one should certainly be placed.

S. difficilis, sp. nov. Sat late ovalis; minus convexus; nitidus; dense albido-pubescens; subtilius sat crebre punctulatus; rufo-ferrugineus; capite postice, prothoracis disco, elytris (apice obscure rufo excepto), prosterno medio, mesosterno, metasterno, et segmento ventrali basali medio, nigro-æneis. Long., 2 l. (vix); lat., $1\frac{2}{5}$ l.

The superficial resemblance of this insect to some of the Australian species of *Rhizobius* is very remarkable. Having only a single specimen I am unable to ascertain certainly whether the anterior cotyloid cavities are open behind, but as far as I can see they are not. The prothorax is about twice as wide as long down the middle, its anterior margin feebly concave but rather strongly sinuate behind the eyes, the base about half again as wide as the front margin, the sides gently arched, the front angles rather prominent but not sharp, the hind angles well developed and gently obtuse. The whitish pubescence is dense uniform and rather woolly looking over the upper surface—it is mixed with a few erect longer ferruginous hairs. The punctuation is a little stronger on the head and a little closer on the prothorax than on the elytra; it does not very nearly resemble the punctuation of any other of the common species known to me, being (on the elytra) about as close as in *R. ventralis*, Er., but

besides being finer than in that insect, it has a faint, obliterated, appearance.

South Australia; I am not sure whether I took this specimen near Adelaide or in the Port Lincoln district.

SCYMNUS.

A. Prosternum antice æqualiter convexum, nec depressum nec carinatum.

S. inusitatus, sp. nov. Ovalis; pubescens; sat convexus; nitidus; piceus; tibiis tarsisque dilutioribus; capite prothoraceque obsolete, elytris fortius crebrius, punctulatis. Long., 1 l.; lat., $\frac{7}{10}$ l.

The mesosternum is of moderate size and is truncate in front; the abdominal lamellæ are incomplete, their hind and external outline being confused with the outline of the basal ventral segment. There are six ventral segments, the apical four not differing much *inter se* in length; the suture between the basal and next segment is very fine and obscure in the middle; the metasternum is impunctate down the middle, its sides (and also the ventral segments) being lightly and sparingly punctulate. The elytral puncturation compared with that of *C. flavifrons*, mihi, is larger, more sparing, and much smoother.

The number of ventral segments in *Scymnus* is stated by Dr. Chapuis as five, but even in some European *Scymni* there is a small sixth segment, so that the development of the sixth segment in the present species may be merely a question of degree. The entire absence of any longitudinal sculpture traversing the median part of the prosternum is also approximated by some European forms attributed to the genus. Therefore, although it is likely that these peculiarities will sooner or later be regarded as valid generic characters, I do not think they call for the immediate creation of a new name.

Near Port Lincoln; taken by sweeping low plants.

AA. Prosternum medio longitudinaliter depressum, spatio depresso utrinque longitudinaliter carinato.

B. Spatio depresso sat lato plus minus parallelo.

S. insidiosus, sp. nov. Breviter ovalis; pubescens; sat convexus; nitidus; piceo niger; capite, prothorace (disco excepto), elytris maculis nonnullis epipleurisque, abdominis apice, et pedibus (tibiis posticis 4 plus minus infuscatis exceptis), testaceis; capite prothoraceque vix perspicue, elytris obscure minus crebre, punctulatis. Long., $\frac{7}{10}$ l.; lat., $\frac{3}{5}$ l. (vix.)

Var. pallipes. Pedibus totis pallide testaceis.

Var. major. Corpore majore, prothorace pedibusque totis testaceis.

The markings on the elytra are best described by regarding the testaceous portion as the ground colour. There then appear to be the following pitchy-black markings, viz. :—(*a*) A triangle whose base coincides with the base of the elytra, and whose apex falls on the suture at about half its length, and then is produced somewhat narrowly down the suture to the apex; (*b*) an obscure marginal border; (*c*) an oblique fascia connecting the middle of the marginal border, and the suture at two-thirds of its length from the base. There are only five ventral segments, which, together with the sides of the metasternum, are finely but distinctly punctulate, while the middle portion of the latter is impunctulate. The antennæ are very short; I can only count ten joints distinctly.

In my example of the var. *pallipes* each elytron has an additional pitchy-black portion, forming a longitudinal connection between the fascia and the middle of the side of the common basal triangle, so that the testaceous portion which in the type appears as a vitta (running from the shoulder to near the middle of the suture) is here divided into two pieces. In the var. *major* the markings resemble those of the type, but are less clearly defined. The puncturation in both the vars. seems stronger and better defined than in the type, and they may possibly represent a (or even two) new species. All these bear a remarkable superficial resemblance to *Bucolellus ornatus*, mihi, which, however, besides its generic differences, is punctured very differently.

I have met with the type near Port Lincoln, the var. *pallipes* on Yorke's Peninsula, the var. *major* at Woodville.

S. lubricus, sp. nov. Breviter ovalis; pubescens; sat convexus; sat nitidus; vix perspicue punctulatus; niger; capite, prothoracis lateribus margineque antico, et elytrorum lateribus apiceque, plus minus obscure piceo-rufescentibus; antennis, palpis, pedibusque (femoribus plus minus piceis exceptis), latius rufescentibus. Long. $1\frac{1}{5}$ l.; lat. $\frac{4}{5}$ l.

Under a powerful Coddington lens the elytra near the suture appear punctureless, but towards the sides and apex some excessively minute and decidedly sparse puncturation is traceable; the puncturation is very much feebler than in *S. notescens*. The underside resembles that of *S. Meyricki*, but the metasternum is not distinctly wrinkled transversely. My example has a small sixth ventral segment—the first ventral suture is very fine, but distinct.

Port Lincoln.

S. Meyricki, sp. nov. Breviter ovalis; pubescens; sat convexus; sat nitidus; crebre subtilius punctulatus; niger; capite, prothoracis lateribus margineque antico, elytrorum macula

magna ante apicem, antennis, palpis, pedibusque (his femoribus plus minus piceis), rufescentibus. Long., $1\frac{1}{5}$ l.; lat., $\frac{4}{5}$ l.

Var. ? *obscuripes*. Capite, prothoracis lateribus, femoribus omnibus, et tibiis 4 posterioribus, piceis.

The red spot on the elytra occupies the posterior declivity, and is not very conspicuous anywhere, but most so close to the suture; it does not quite reach the apex. The sides of the metasternum and the ventral segments are distinctly punctulate, the middle portion of the former finely wrinkled transversely. There is a small sixth ventral segment; the first ventral suture is very fine, but distinct. The puncturation of the upper surface is very much like that of the common *S. flavifrons*, but appears a little less asperate. In most examples the reddish tone is less decided on the head than on the other red parts.

The puncturation of the var.? is slightly feebler, and more sparse than in the type; it is very likely to be a distinct species, but may possibly be the other sex of the same.

The type was collected in Western Australia by E. Meyrick, Esq., the var. ? near Port Lincoln by myself.

S. Poonindiensis, sp. nov. Breviter ovalis; pubescens; sat convexus; sat nitidus; niger; capite, prothoracis angulis anticis margineque antico, antennis, palpis, femoribus anticis, et tibiis tarsisque omnibus, testaceis; elytris obscure rufo-umbratis, epipleuris plus minus rufescentibus; capite subtilius sat crebre, prothorace vix perspicue, elytris subtiliter sat crebre, punctulatis. Long., $1\frac{1}{5}$ l. (vix); lat. $\frac{4}{5}$ l.

? Sexus alter. Capite (labro excepto) piceo.

In the type the reddish tone on the elytra is comparatively slight, and is vaguely diffused over the sides and apex; in the specimen mentioned as "? Sexus alter" obscure red is the prevailing colour of the elytra, black being confined to a common space included within a line on either side running from the humeral callus obliquely towards the middle of the suture, and thence continued parallel and close to it to the apex. The puncturation of the elytra is much like that of *S. Meyricki*, but the impunctate prothorax renders this insect very distinct. The middle of the metasternum is scarcely wrinkled; there are five ventral segments; the first ventral suture is distinct, but fine.

Poonindie, near Port Lincoln.

S. Casuarinæ, sp. nov. Breviter ovalis; pubescens; minus convexus; nitidus; brunneo-ferrugineus; capite, prothorace (disco piceo excepto), antennis, palpis, pedibusque (his femoribus posticis exceptis), epipleuris, et abdominis apice, testaceis; metasterno et abdominis segmentis basalibus nonnullis piceis; capite subtiliter sat crebre, prothorace vix

perspicue, elytris suturam versus antice crebre sat fortiter, his latera apicemque versus gradatim obsoletius, punctulatis. Long., 1 l. ; lat., $\frac{4}{5}$ l. (vix).

This species is easily distinguished by the puncturation of its elytra, which is almost coarse over a small space on either side of the suture a little behind the scutellum, and thence becomes finer and more obsolete in all directions. The sides of the metasternum and the ventral segments are rather coarsely punctured, the middle of the metasternum is almost sculptureless. There are five ventral segments ; the first ventral suture is fine, but very distinct.

Port Lincoln ; beaten from Sheoak (Casuarina).

S. simplex, sp. nov. Breviter ovalis ; pubescens ; minus convexus ; nitidus ; crebre subtiliter punctulatus ; piceo-brunneus ; capite, prothorace (disco piceo excepto), antennis, palpis, tibiis, tarsisque, sordide testaceis ; metasterno elytrisque piceis ; his obscure rufo-maculatis. Long., $1\frac{1}{5}$ l. ; lat., $\frac{4}{5}$ l.

The most nearly allied, perhaps, to *S. Meyricki*, which, however, is not so closely punctured as the present species. The red marking on the elytra consists of a small ill-defined, and not at all conspicuous, blotch near the lateral margin a little behind its middle. The sides of the metasternum are finely and very closely punctured ; the middle is almost sculptureless. The puncturation of the ventral segments is moderately fine and close near the base, and becomes gradually finer and closer to the apex. There are five ventral segments ; the first ventral suture, though finer in the middle than the rest, is very distinct.

Petersburg (S.A.) ; beaten from pine.

S. aspersus, sp. nov. Ovalis ; pubescens ; sat convexus ; nitidus ; sparsim subtilissime (elytris latera apicemque versus magis perspicue exceptis) punctulatus ; piceus ; capite, prothoracis angulis anticis, elytris maculis nonnullis, prosterno (obscure), epipleuris, antennis, palpis, tibiis anticis, et tarsis omnibus, testaceis. Long., $\frac{4}{5}$ l. ; lat., $\frac{3}{5}$ l. (vix).

The testaceous marks on the elytra are very obscure, and consist of an elongate spot on either side of the middle of the suture and an oblique line (somewhat resembling a fascia abbreviated at both ends) near the apex. The puncturation of the head and prothorax cannot be seen without a powerful lens ; that of the elytra is similar near the scutellum, but becomes gradually better defined towards the sides and apex. On the underside the middle of the metasternum is scarcely punctulate, bnt bears some fine transverse wrinkles ; there is a distinct sixth ventral segment ;

the ventral segments are finely and sparsely punctured, the basal ventral suture almost obliterated in the middle.

Port Lincoln (S.A.).

S. australis, sp. nov. Sat breviter ovalis; breviter pubescens; subtilissime crebrius punctulatus; subtus rubro-ferrugineus, supra fusco-testaceus; prothoracis basi lateribusque et elytrorum sutura, marginibus, maculisque pone basin nonnullis, piceo-nigris; antennis palpis pedibusque testaceis, tibiis (nonnullis exemplis) infuscatis. Long., 1 l. (vix); lat., $\frac{3}{5}$ l.

I do not observe any structural difference between this species and *S. aurugineus*, except that this is wider and less parallel in form; its puncturation is so fine and faint as to be scarcely visible under a strong lens. The basal margin of the prothorax, and lateral margins of it and the elytra, are very narrowly blackish; the suture is more widely so; in this typical specimen there is a black spot on the humeral callus and another between it and the suture, and an obscure piceous cloud on the hinder part of the disc, but in other examples some of these spots are wanting. On the underside the pale testaceous colour of the reflexed margin of the elytra is in strong contrast with the dark red general surface.

Petersburg (South Australia).

S. flavifrons, sp. nov. Breviter ovalis; pubescens; niger vel piceus; capite, prothorace antice et lateraliter, pedibus 4 anticis, tibiis tarsisque posticis, læte flavis; elytris apicem versus rufescentibus; capite prothoraceque subtilissime, elytris minus subtiliter, punctulatis; sutura ventrali prima in medio obliterata. Long., $\frac{4}{5}$ l.; lat., $\frac{3}{5}$ l. (vix).

The yellow area on the prothorax is limited behind by a regular curve with its extremities at the posterior angles and its middle nearly touching the middle of the anterior margin of the segment. The pubescence is moderately dense, and semierect (or at least not flatly depressed), and is of a shining silvery white colour. The puncturation is moderately fine and rather dense, and has an asperate appearance as though there were a tendency to granulation on the intervals between the punctures; it is a little more dense near the sides than elsewhere, and scarcely differs on the upper and under surface except in the middle part of the metasternum being almost lævigate; it is not unlike that of the European *S. capitatus*, Fab., but is a little finer and closer.

Common, and widely distributed in South Australia, occurring as far North as Lakes Torrens and Eyre, also near Adelaide, in the West, &c.

In company with the above, and equally commonly, I find specimens which I conjecture to be the other sex (probably

female). They differ in having the yellow colouring less vivid and confined to the mouth organs, legs (even these being in some examples clouded with brown), and (in occasional examples) the extremities of the anterior margin of the prothorax. The anterior prolongation of the metasternum appears to be a little wider than in the type, and on this account there is a possibility of their being a distinct species.

The following forms appear to me to be merely varieties or local races of *S. flavifrons*:—

var? *occidentalis*. Differt maris capite prothoraceque minus argute flavo tinctis, elytris postice haud vel vix rufescentibus; feminæ pedibus lætius testaceis. Sent to me from Western Australia by E. Meyrick, Esq.

var? *Victoriæ*. Differt magnitudine (1 l.) et feminæ (mare haud observato) pedibus lætius testaceis, prothoracis angulis anticis lætius rufescentibus, elytrisque apicem versus haud rufescentibus. Taken by me in Western Victoria.

S. aurugineus, sp. nov. Sat elongato-ovalis, aureo-pubescens; leviter minus crebre punctulatus; piceus; supra ferrugineus, elytris ante medium V aureo conspicue ornatis; antennis palpis pedibus et abdominis apice ferrugineus. Long., $1\frac{1}{10}$ l.; lat., $\frac{3}{5}$ l.

Apparently not a variable insect; rather narrow and parallel. The puncturation of the upper surface smoother finer and less close, that of the underside very much more sparing, than in *S. flavifrons*; the middle of the metasternum without visible punctures. The elytra has a mottled (yellow and reddish) appearance difficult to describe in detail, but in all the examples I have seen there is on each elytron a golden yellow vitta (very conspicuous in certain lights), which runs from immediately below the shoulder obliquely to just in front of the middle of the suture, which, however, it does not quite touch—the vittæ of the two elytra thus forming a V (the two arms, however, not quite meeting at the angle). On each elytron the darkest colouring (in some examples deep pitchy) forms a margin on both sides of the vitta. The suture between the first and second ventral segments is fine but distinct.

Widely distributed in South Australia, but apparently not very common. I have it from Kapunda, Petersburg, and Lake Torrens.

BB. Spatio depresso angusto antice subacuto.

S. notescens, sp. nov. Breviter ovalis; capillis sat elongatis erectis sat dense vestitus; sparsius subtilius punctulatus; niger, elytris antice macula permagna testacea notatis; labro,

palpis, antennis, tibiis, tarsis, prothoracisque angulis anticis, plus minus rufescentibus. Long., 1 l.; lat., $\frac{4}{5}$ l.

Maris capite, prothoracis lateribus et femoribus anticis læte rufis.

Much more sparingly punctured than either of the preceding two species. The testaceous spot on each elytron comes near touching both the suture and the lateral margin; its front edge is separated from the anterior margin by a distance equal to about two-thirds the length of the prothorax, and its hind margin falls a little behind the middle of the elytron. In shape it may be described as a quadrate figure a little wider than long, deeply emarginate posteriorly, and having its antero-external corner cut off or emarginate. The suture between the first and second ventral segments is fine but distinct,

Common near Port Lincoln; also in the Adelaide district.

AAA. Prosternum inter coxas longitudinaliter bicarinatum, antice æqualiter convexum.

C. Lamellæ abdominalis haud integræ.

S. oscillans, sp. nov. Ovalis; pubescens; sat convexus; nitidus; piceus; prothoracis lateribus, antennis, palpis, epipleuris, pedibusque, testaceis; elytris piceo-brunneis, latera apicemque versus dilutioribus; capite prothoraceque subtiliter minus crebre, elytris sparsius distincte, punctulatis. Long., $1\frac{1}{10}$ l.; lat., $\frac{7}{10}$ l.

The puncturation, compared with that of *S. flavifrons*, *simplex*, &c., is much smoother and more sparse. It is not unlike that of *S. Meyricki*, which, however, is a wider insect proportionally. The sculpture of the prosternum at once distinguishes it from nearly all its allies. The sides of the metasternum are closely, and the ventral segments less closely, punctured; the middle of the former is finely wrinkled transversely. There is a small distinct sixth ventral segment. The first ventral suture is fine, but distinct.

Petersburg, S.A.

S. Sedani, sp. nov. Breviter ovalis; sat convexus; nitidus; pubescens; piceus; elytris rufo bimaculatis; abdomine rufescenti; tibiis, tarsis, epipleurisque, sordide testaceis; capite prothoraceque subtiliter crebrius, elytris fortius minus crebre, punctulatis. Long., $1\frac{1}{2}$ l.; lat., 1 l.

The elytra are broadly red in the basal third of the lateral margin, and this red mark is prolonged from its hinder end obliquely towards the suture which it approaches (but not very closely) just in front of the middle; the hinder red spot occupies the apical one-sixth of the elytra. The puncturation of the elytra is stronger than in any of the *Scymni* described above. The

metasternum at its sides and ventral segments are rather strongly punctured, the former much more closely than the latter. The middle of the metasternum is obscurely punctulate. There are only five ventral segments. The basal ventral suture is nearly obliterated in the middle.

Sedan, S.A.; taken by Mr. B. S. Röthe.

CC. Lamellæ abdominales integræ.

S. parallelus, sp. nov. Oblongus; subparallelus; minus convexus; nitidus; pubescens; piceus vel ferrugineo-piceus; tibiis, tarsorum basi, et elytris singulis vitta lata, testaceis; capite subtiliter obscure, prothorace vix perspicue, elytris crassius subrugulose, punctulatis. Long., $\frac{4}{5}$ l.; lat., $\frac{2}{5}$ l.

Not very like *Scymnus* in general apperance, owing to its more elongate flattened form and not very finely granulated eyes; it is, moreover, the only Australian species (known to me) attributable to the genus in which the abdominal lamellæ are entire, but I cannot find any satisfactory character for separating it. The upper surface is of a shining pitchy colour, inclining to ferruginous about the sides of the elytra, each of which bears a wide and rather obscure testaceous vitta commencing about the middle of the front margin, running down the disc to near the apex, and then turning towards and meeting the suture; the inner margin of this vitta is better defined than the outer, so that the two vittæ (meeting near the apex) enclose an elongate common space of a deep piceous colour, and externally merge by gradual shades of colour into the general hue. In one of my two examples nearly the whole under surface is reddish, including the femora; in the other it is pitchy, with the apical segments reddish. The prothorax is scarcely twice as wide as long, its front scarcely emarginate, the front angles but little produced and not sharp, the hind sharply rectangular, the base not much wider than the front, the sides nearly straight. The abdominal lamellæ nearly reach the apex of the basal ventral segment, and are very narrow, their external margin being on the front of the segment, nearly as far from the lateral margin of the segment as the whole width of the lamella along the front margin. The first ventral suture, though perfectly distinct, is evidently feebler in the middle than the other sutures. In one example there is a distinct, in the other a scarcely distinct, small sixth ventral segment. The infuscation of the claw joint of the tarsi is (if invariable) a conspicuous character. The epipleuræ are more or less testaceous.

Port Lincoln.

RHIZOBIUS.

A. Prosternum medio longitudinaliter depressum, spatio depresso utrinque longitudinaliter carinato.

R. discolor, *Er.* [var (?) *proprius.*] The insect which I attribute to this species measures $2\frac{1}{2}$ l. in length, whereas *R. (Scymnus) discolor* is said to be 2 l., and there is evidently some confusion or mistake about the size, for comparing it with *R. (Scymnus) ventralis*, which is said to be $2\frac{1}{4}$ l., Erichsen calls it "duplo fere minor." Besides this, my specimen displays some colour discrepancy, its upper surface being red brown, inclining to pitchy on the head and prothorax, with the margins of the latter, the shoulders, and the suture, bright red; whereas Erichsen makes the colour black, with the head and the lateral margins of the prothorax red. According to Erichsen the prothorax should be rather sparingly punctulate, whereas in my example this segment (though less closely punctured than the elytra) bears decidedly dense puncturation at the sides, while that of the disc is a little more sparse. The elytra are strongly subrugosely and very closely punctured, and have obsolete indications of striation, but without the slightest tendency to linear punctuation. The whole upper surface is clothed with short, very fine, sub-recumbent pubescence, among which are other hairs standing up more erectly and evidently (though not very much) stouter and longer.

Compared with the European *R. liturus*, Fab., this insect is very much larger and much more parallel-sided in form, with the prothorax very much more transverse (twice as wide as long), its sides being more strongly rounded. The puncturation throughout is very similar to that of *R. liturus*.

As I have seen several specimens of the above described form not varying *inter se*, except in a tendency in some to a reddening of the elytral margins as well as the suture, it would seem to represent at least a localized variety deserving of a name, and is very likely to be a species distinct from the Tasmanian original. I may add that M. Mulsant mentions the testaceous color of the abdominal plates as a character of *R. discolor*; this is not alluded to by Erichsen, nor do I find it in specimens before me,—which have the underside of a nearly unicolorous ferruginous, the abdominal plates extending back not much more than half the length of the basal ventral segment, and being punctured uniformly with the segment itself.

Occurs near Port Lincoln.

R. cyaneus, sp. nov. Elongatus; vix subparallelus; pubescens; subnitidus; supra (capite piceo excepto) obscure cyaneus; subtus, antennis, palpis, pedibusque, obscure ferrugineis; prothorace quam longiori minus duplo latiori, elytris sat angustiori, antice leviter angustato, lateribus leviter arcuatis, angulis anticis subrotundatis haud prominulis, posticis sub-

rectis; capite prothoraceque subtilius sparsius, elytris subfortiter sat crebre, punctulatis; metasterno medio sparsim subtiliter punctulato, transversim vix rugato. Long., $1\frac{3}{5}$ l.; lat., $\frac{4}{5}$ l.

The abdominal plates reach back nearly to the apex of the basal segment, and are punctured much more sparsely than the lateral portion of the segment. The flattened ridge of the prosternum is at its widest immediately behind the front. The pubescence of the upper surface is mixed with hairs that are somewhat stouter and more erect than the rest.

A single specimen occurred to me in Western Victoria.

R. læticulus, sp. nov. Minus elongatus; vix subparallelus; sat æqualiter pubescens; nitidus; piceus; capite, prothorace, pedibus, prosterno, abdominis apice, et (nonnullis exemplis) signaturis quibusdam in elytris positis, testaceis; prothorace quam longiori fere duplo latiori, elytris angustiori, antice minus angustato, lateribus minus rotundatis, angulis anticis rotundatis haud prominulis posticis subrectis; capite prothoraceque subtiliter, elytris minus subtiliter, sparsim punctulatis; metasterno subtiliter transversim rugato, vix perspicue punctulato. Long., 1 l.; lat., $\frac{3}{5}$ l.

In one example (the most highly coloured) the prothorax is dark red in the middle, becoming bright testaceous at the sides; and on the elytra the shoulders, together with an obscure vitta near the suture, are testaceous; in others the whole prothorax is uniformly reddish and the elytra are nearly unicolorous. The abdominal plates are about two-thirds the length of the basal segment, and are punctured as strongly and nearly as closely as the general surface of the segment.

Woodville.

R. Evansi, Muls. Ovalis; sat convexus; pubescens; sat nitidus; supra piceo-niger vix æneo-tinctus; capite, prothorace (plus minus), corpore subtus, antennis, palpis pedibusque, ferrugineis; prothorace quam longiori vix duplo latiori, elytris basi parum angustiori, antice sat angustato, lateribus subrectis, angulis anticis rotundatis subprominulis, posticis obtusis; capite prothoraceque crebrius subfortiter, elytris crebre sat fortiter (latera versus præsertim) punctulatis; metasterno medio (antice præsertim) fortius crebrius punctulato. Long., $1\frac{3}{5}$—2 l.; lat., $1\frac{1}{8}$—$1\frac{2}{5}$ l,

The abdominal plates are about three-fourths the length of the basal segment, and are punctured more strongly and less closely than the sides of the segment. The flattened ridge of the prosternum is uniformly narrowed from its base to the front. The

pubescence of the upper surface is of a silvery white colour, and is much mixed with long erect hairs. Compared with the European *R. liturus* this species is much wider, with more strongly rounded sides and much stronger puncturation.

I have re-described this insect, because the original description is very incomplete and founded on a very pale specimen. I do not think there is any doubt of the correctness of my identification.

Apparently common all over Southern Australia.

R. insipidus, sp. nov. Elongato-ovalis; sat convexus; pubescens; minus nitidus; totus brunneus (meso- et meta-sternis et abdomine piceis exceptis); prothorace quam longiori paullo minus duplo latiori, elytris basi vix angustiori, antice vix angustato, lateribus parum arcuatis, angulis anticis plane rotundatis haud prominulis, postice subrectis; capite prothoraceque subtiliter, elytris sat fortiter, sat crebre punctulatis; metasterno medio subtiliter transversim rugato vix perspicue punctulato. Long., $1\frac{1}{5}$ l.; lat., $\frac{4}{5}$ l.

The abdominal plates nearly reach the apex of the basal segment, and are punctured a little more sparingly than the sides of the segment. The flattened ridge of the prosternum is strongly narrowed from its base to the front, which is pointed. The pubescence of the upper surface is whitish-brown in colour, and is mixed with a few rather long erect hairs. In some examples the suture is narrowly infuscate, and in some the elytra have a slight opalescent greenish gloss. The puncturation of the elytra is less strong than in *R. Evansi* and *R. cyaneus*, and slightly stronger than in *R. læticulus*. It is very similar to that of *R. liturus*, Fab.

Roseworthy, S.A., and Kangaroo Island.

R. debilis, sp. nov. Ovalis; sat convexus; pubescens; nitidus; supra piceo-niger vix æneo-tinctus; capite, prothorace, corpore subtus, antennis, palpis, pedibusque, plus minus ferrugineis; prothorace quam longiori duplo latiori, elytris basi vix angustiori, antice sat angustato, lateribus subrectis (marginibus subfortiter reflexis), angulis anticis rotundatis, posticis distinctis obtusis; capite prothoraceque minute sat crebre, elytris prope scutellum subtilissime sparsim (latera apicemque versus magis distincte), punctulatis; metasterno medio vix distincte sculpturato. Long., $1\frac{2}{5}$ l; lat., $\frac{4}{5}$ l.

An obscure species resembling *R. Evansi*, but smaller and differently punctured, the punctures on the elytra near the scutellum being scarcely visible under a Coddington lens. The prothorax is very wide and short, with its lateral edges more strongly reflexed than is usual in the genus, especially at the anterior angles, which are sub-explanate. The abdominal plates

nearly reach the apex of the basal segment, and are very sparingly punctulate. The flattened ridge of the prosternum (which, however, is scarcely so much flattened as usual) is parallel-sided. The pubescence scarcely differs from that of *R. Evansi*.

Port Lincoln; not common. An abraded specimen from near Lake Eyre seems to be identical, but its condition will not allow of certainty.

R. Lindi, sp. nov. Ovalis; sat convexus; pubescens; sat nitidus; piceus, antennis, palpis, corpore subtus, pedibusque, plus minus rufescentibus; prothorace quam longiori vix duplo latiori, elytris basi vix angustiori, antice vix angustato, lateribus subrectis, angulis anticis rotundatis, posticis distinctis obtusis; capite prothoraceque subtilius, elytris magis fortiter, sat crebre punctulatis; metasterno medio subtiliter transversim rugato sat distincte punctulato. Long., 1—1⅔ l.; lat. ⅗—1 l.

The abdominal plates are as in *R. insipidus*. The flattened ridge of the prosternum is strongly narrowed from its base to the front, where it is truncate. The pubescence scarcely differs from that of *R. Evansi*. Nearest to *R. insipidus*, from which its puncturation, though not quite so strong, scarcely distinguishes it. It is, however, a wider and shorter insect, more strongly rounded on the sides, differently coloured, and especially with the prosternal ridge wider and truncate in front. It is smaller, very much more feebly punctured, and more obscurely coloured than *R. Evansi*, and differs from *R. debilis*, *inter alia*, in its stronger puncturation and prosternal ridge narrowed to the front.

Port Lincoln.

R. ruficollis, sp. nov. Ovalis; sat convexus; pubescens; nitidus; subtus ferrugineus; capite, prothorace, pedibusque læte rufis; prothorace quam longiori paullo minus duplo latiori, elytris basi vix angustiori, antice parum angustato, lateribus parum arcuatis, angulis anticis rotundatis, posticis subrectis; capite prothoraceque subfortiter, elytris paulo magis fortiter minus crebre punctulatis; metasterno medio transversim rugato subfortiter punctulato. Long., 1⅕ l.; lat., ⅘ l.

The abdominal plates are about three-fourths the length of the basal segment, and are punctured much more strongly and sparsely than the sides of the segment. The prosternal ridge is as in *R. insipidus*. The pubescence resembles that of *R. Evansi*, but the longer erect hairs are even longer and stouter than in that species.

Very differently coloured from all the preceding, and distinguished from all but *R. insipidus* by the sharply-pointed prosternal ridge. From the latter it differs in the pubescence, the

shorter abdominal plates, more strongly sculptured metasternum, rather more sparing puncturation of the upper surface where there is less difference, moreover, than usual in the genus between the punctures on the prothorax and those on the elytra, and in the dark elytral epipleuræ (those of *R. insipidus* show up as of a pale brown colour in strong contrast to the reddish pitchy metasternum and hind body), besides other differences of colour, &c.

Port Lincoln.

R. ventralis, Er. I have taken near Port Lincoln, and also near Adelaide, examples of an insect which I cannot doubt is this remarkably coloured species, but if so, it is desirable to point out that Erichsen is in error in calling it "oblongo-ovalis," as it is rather exceptionally wide. It is, of course, possible that I have not the genuine thing before me, but my specimens agree perfectly with the description in every character except that I have named, including the unusual character of having the anterior angles of the prothorax membranous. Mulsant uses a similar expression in his (apparently independent) description, but afterwards furnishes measurements that certainly do not justify it, but show the species to be of much broader proportions than others to which he applies the same term.

The insect before me is rather unlike *Rhizobius* in facies, but does not differ structurally in any respect so far as I can discover.

Since many of the species of this first section of *Rhizobius* are closely allied *inter se*, the following tabulation may be serviceable :—

A. Elongate subparallel species.
  B. Prothorax and elytra brown or ferruginous.
    discolor, Er. ? (var. *proprius*, Blackb.)
  BB. Prothorax and elytra cyaneous. *cyaneus*, Blackb.
AA. Oval species.
  B. Upper surface clothed with long erect hairs as well as short pubescence.
    C. Prosternal ridge sharply pointed in front.
      D. Epipleuræ of elytra dark coloured.
        ruficollis, Blackb.
      DD. Epipleuræ of elytra pallid (in contrast with the much darker under surface of body).
        insipidus, Blackb.
    CC. Prosternal ridge not sharply pointed in front.
      D. Elytra strongly punctulate (more strongly than those of *R. liturus*, Fab.) *Evansi*, Muls.
      DD. Elytra very finely punctulate ; prosternal ridge with parallel sides. *debilis*, Blackb.
      DDD. Elytra distinctly but not very strongly punctulate ; prosternal ridge narrowed forward.
        Lindi, Blackb.

BB. Upper surface evenly pubescent. *læticulus*, Blackb.

AAA. Form ovate; under surface black, except ventral segments, which are bright red. *ventralis*, Er.

AA. Prosternum antice æqualiter convexum, longitudinaliter neccarinatum nec sulcatum.

B. Species majores.

In this group the intercoxal portion of the prosternum is more or less carinate laterally but the part in front of the coxæ is simply convex with more or less tendency to be compressed, especially in the extreme front, owing to which the middle of the front margin is more or less angularly prominent. The eyes are extremely coarsely granulated and placed very obliquely.

R. australis, sp. nov. Oblongo-ovalis; subparallelus; minus convexus; sat nitidus; pubescens; rufus, elytris (margine laterali sat anguste rufo excepto) piceo-nigris; capite prothoraceque subtiliter sat crebre, elytris fortius subrugulose, punctulatis. Long., $2\frac{2}{5}$ l.; lat., $1\frac{2}{5}$ l.

The red lateral margin of the elytra is not very sharply defined or conspicuous; it is continued round the apex where it is a little dilated. The pubescence of the upper surface is uniform (*i.e.*, not containing hairs conspicuously longer and more erect than the rest). The third joint of the antennæ is as long as the following two together; the ninth and tenth joints are transverse and have their inner apex produced in a kind of lobe which is curved forward against the basal part of the next joint. The prothorax is quite twice as wide as long, widest at the base which is more than half again as wide as the front margin, the latter moderately emarginate with angles quite rounded off; the sides converge slightly from the base to about the middle, thence roundly and more strongly. On the underside the puncturation is fine and close on the sides (and almost effaced in the middle) of the meso and meta-sterna, fine and close on the sides (and very sparing in the middle) of the ventral segments; the abdominal plates are about five-sixths the length of the basal segment and are punctured more sparsely than the adjacent surface; the mesosternum is quite a third as long as the metasternum, and is not emarginate in front; the prosternum is rather wide and flat between the coxæ with its sides parallel and finely keeled, its anterior (and longer) portion being evenly and rather strongly convex; the angular prominence of the anterior margin of the prosternum is extremely feeble. The widest part of the prothorax is five-sevenths of the width of the widest part of the elytra. The claws are appendiculate, but the inner apex of the basal piece is sharp and tooth-like. The middle of the hind margin of the basal ventral segment is roundly and widely (but

rather conspicuously) produced backward over the second segment, in all the specimens I have seen.

Near Adelaide; also taken by Mr. J. G. O. Tepper on Kangaroo Island.

R. subfusca, sp. nov. Oblongo-ovalis; minus parallelus; sat nitidus; pubescens; rufo-fuscus; prothorace elytrisque nigricantibus; capite prothoraceque fortius, elytris magis etiam fortiter, crebre punctulatis. Long., $2\frac{1}{5}$ l,; lat., $1\frac{1}{5}$ l.

The whole under surface is of a somewhat fuscous red colour—the antennæ palpi and legs red rather than fuscous—the upper surface (except the head and anterior angles of prothorax which are reddish) is very dark fuscous. The pubescence is uniform. The antennæ are as in *R. australis*. The prothorax is not more than a third again as wide as it is long down the middle. In other respects the prothorax resembles that of *R. australis* except that it is more evenly narrowed from the base to the apex. The whole undersurface is strongly punctured, the puncturation being very coarse and not close on the prosternum and thence gradually finer and closer hindward till on the apical ventral segment it is very fine and very close. The abdominal plates are hardly three-fourths the length of the basal segment and are punctured rather more coarsely and sparsely than the adjacent surface. The mesosternum resembles that of *R. australis* except that it is very gently and roundly emarginate in front. The prosternum is nearly parallel sided between the coxæ, but hardly distinctly carinate on its margins; in front of the coxæ it is strongly compressed with the angular prominence in the middle of its anterior margin very strong. The greatest width across the elytra is half again the greatest width of the prothorax, though the true base of the former is hardly wider than the base of the latter. The hindward curve of the hind outline of the basal ventral segment is scarcely apparent. The eyes are very coarsely granulated but scarcely so oblique as in *R. australis*.

Adelaide.

N.B.—Although this species differs strongly from the preceding, in many respects its structural differences appear to be only in degree. The prosternum makes a distinct approach towards that of *Cryptolæmus* from which its appendiculate claws, coarsely facetted eyes, &c., distinguish it. It is quite possible that it may eventually have to be distinguished generically from *R. australis*.

R. xanthura, Muls. Specimens in my own and other collections, taken near Mount Gambier, on Kangaroo Island, and other places, evidently pertain to this species. The following particulars are not mentioned in M. Mulsant's description:—Puncturation of the upper surface very close and rather fine,

but strong (a little finer on the prothorax than on the elytra); prosternum as in *R. australis* but anteriorly a little less convex.

**R. major*, sp. nov. Ovalis; minus convexus; sat æqualiter pubescens; sat nitidus; ferrugineo-rufus, elytris (apice anguste rufa excepta) picescentibus; prothorace quam longiori plus duplo latiori, antice leviter angustato, angulis anticis rotundatis, posticis subrectis; capite prothoraceque sat crebre, elytris minus crebre, leviter punctulatis. Long., $2\frac{2}{5}$—$3\frac{1}{5}$ l.; lat., $1\frac{3}{5}$—$2\frac{1}{5}$ l.

The abdominal plates are a little more than two-thirds the length of the basal segment; they are punctured finely and closely (like the adjacent surface), and also bear some large sparse punctures. The flattened ridge of the prosternum is narrowed from its base to the front, which is rounded. The underside is closely and finely punctured laterally, the metasternum being nearly impunctate in the middle—the ventral segments in the middle more coarsely and less closely punctured than at the sides.

A large robust species bearing much superficial resemblance to my *R. australis*—from which it differs (apart from the structure of the prosternum) in its generally superior size and robustness, the stoutness of its tarsi, and in the epipleuræ of the elytra being dark piceous, whereas in every specimen that I have seen of *R. australis* they are of a bright ferruginous colour, concolorous with the general surface of the underside. The pubescence, moreover, is of a rich golden brown, and in *R. australis* is pale brownish white.

Fowler's and Streaky Bay. In my collection; also taken by Prof. Tate.

BB. Species minores. Oculi minus obliqui.

R. nitidus, sp. nov. Sat breviter ovalis; convexus; pubescens; nitidus; ferrugineo-piceus; antennis, palpis, pedibus, prothorace antice, prosterni lateribus, et elytrorum epipleuris dilutioribus; prothorace quam longiori duplo latiori, antice angustato, angulis anticis rotundatis, posticis subrectis; capite elytrisque leviter sparsim (his postice fortius), prothorace vix perspicue, punctulatis. Long., $\frac{4}{5}$ l.; lat., $\frac{3}{5}$ l.

The abdominal plates are hardly two-thirds the length of the

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* This description I have accidentally misplaced in the memoir; it should follow the description of *R. cyaneus* on p. 200. Owing to this accident I have also omitted the species from the tabulation on p. 203 of species with the prosternum longitudinally flattened. In the tabulation *R. major* would fall among the oval species but is distinct among them by its much greater size and other characters.

basal segment, and are punctured much in the same way as the adjacent surface. The prosternum is evenly convex longitudinally, and its front margin is not in any noticeable manner angularly prominent in the middle. The underside is finely punctulate—more closely at the sides than in the middle. The few specimens that I have seen of this insect are unfortunately much abraded, but I think there is no doubt that in a fresh specimen the pubescence of the upper surface is tolerably close and even, and of a silvery white colour.

Apart from the great difference in the structure of the prosternum, this species has the superficial aspect of a liliputian *R. debilis*.

Port Lincoln.

R. occidentalis, sp. nov. Ovalis; sat convexus; pubescens; vix perspicue punctulatus; nitidus; lurido-testaceus; elytrorum epipleuris pallide flavis, macula basali communi triangulari, sutura, linea communi arcuata post medium, et maculis aliis parvis nonnullis, piceis; prothorace quam longiori vix duplo latiori, antice minus angustato, angulis anticis rotundatis, posticis subrectis. Long., $\frac{4}{5}$ l.; lat., $\frac{3}{5}$ l. (vix).

The abdominal plates and prosternum seem scarcely different from the corresponding parts in *R. nitidus*. Under a powerful Coddington lens there is little defined sculpture visible on the undersurface, except on the ventral segments, where (especially in the middle) some sparse rather fine puncturation can be discerned.

In the unique example that I possess of this insect the prothorax is a little stained with piceous in the middle; on the elytra the fuscous stains consist of a rather broad sutural line, which is crossed near the apex by a short curved line (its convexity hindward) and dilates close to the front into a large triangular patch including the scutellum, but not quite including the humeral calli, and also some small slightly defined spots on the disc.

Western Australia; taken by E. Meyrick, Esq.

R. speratus, sp. nov. Breviter ovalis; pubescens; crebre minus subtiliter punctulatus; fusco-testaceus; elytris anguste piceo-marginatis, postice signatura communi curvata picea instructis—hac cum sutura picescente ancoram simulante. Long., $\frac{4}{5}$ l. (vix); lat., $\frac{3}{5}$ l (vix).

The puncturation is about as fine as in *S. flavifrons*, but is somewhat closer, and there is no appearance whatever of asperity. The dark fuscous markings of the elytra are all narrow, and make up a very accurate representation of an anchor. There is an additional (but very faintly defined) fuscous line joining the extremities of the flukes of the anchor; if this line be taken

into account the resemblance to an anchor is, of course, less noticeable.

Rather closely resembling the preceding superficially, but different in respect of the markings (which do not seem to be variable) and of the puncturation of the upper surface, which is very much closer and better defined. Compared with *R. nitidus* the puncturation is much finer, closer, and more even.

Three specimens occurred to me in the Lake Eyre basin, interior of South Australia.

R. approximatus, sp. nov. Breviter ovalis; sat convexus; pubescens; nitidus; piceus, vix ferrugineus; antennis palpis pedibusque vix dilutioribus; elytrorum epipleuris pallide brunneis; prothorace quam longiori duplo latiori, antice angustato, angulis anticis rotundatis, posticis subrectis; capite subtilius sat sparsim, prothorace vix perspicue, elytris duplo, punctulatis. Long., $\frac{4}{5}$ l. (vix); lat., $\frac{3}{5}$ l.

Unsatisfactorily close to *R. nitidus*, but presenting characters that seem to indicate a distinct species. The slightly shorter, wider, and less convex form is accompanied by a considerable difference of colour, the whole insect being pitchy black, with scarcely any ferruginous tendency (except the feebly reddish tarsi and the pale brown epipleuræ). The puncturation of the elytra, too, is distinct. In *nitidus* it is very faint near the scutellum but grows much stronger laterally and apically (where it is even, rather strong and by no means close), while in the present species the whole surface (even close to the scutellum) is very distinctly and rather closely though finely punctulate, this system of uniform puncturation becoming mingled towards the side and apex with a much more sparse system of much coarser puncturation.

Port Lincoln.

R. umbratus, sp. nov. Breviter ovalis; sat convexus; pubescens; sat nitidus; subtiliter sat crebre punctulatus; fuscus, antennis palpis pedibusque testaceis; elytris obscure testaceo-notatis; meso- et meta-sternis plus minus picescentibus; prothorace quam longiori duplo latiori, antice leviter angustato, angulis anticis subrotundatis, posticis subrectis. Long., $\frac{4}{5}$ l. (vix); lat., $\frac{3}{5}$ l.

The upper surface is marbled or clouded with pale brown and yellowish testaceous in a vague and somewhat intricate manner difficult to describe accurately. In a well-marked specimen the prothorax is brownish testaceous, cloudily darker along the front and base, while the elytra are of a full fuscous colour, with large cloudy testaceous markings consisting of an oblique fascia (much abbreviated at both ends and angulated behind) near the front, and an obscure spot on either side of the suture behind the

middle, the lateral margins and apex being also testaceous. In some examples the testaceous colour of the apex is intensified in the middle in such manner that it appears as a distinct oblique line of almost vivid yellow; but the markings shade off into the ground colour so vaguely that they present a different appearance according to the position from which the insect is looked at. On the underside the prevailing colour is reddish brown with the breast darker, against which the pale testaceous epipleuræ of the elytra show up very conspicuously. The puncturation of the upper surface differs from that in *R. nitidus* and *R. approximatus* by its much more even distribution—the prothorax being punctured almost uniformly with the elytra—and from that in *R. speratus* by its being slightly stronger and less close.

Port Lincoln; also near Adelaide.

SERANGIUM, *gen. nov.*

Caput prothoraci profunde insertum; antennis 11 articulatis, clava magna, basi aperta; oculi oblongi, sat fortiter granulati, intus subparalleli vel potius leviter antice convergentes; epipleuræ sat angustæ, postice angustatæ, concavæ, elytrorum in parte quarta postica obsoletæ, contra pedes intermedios et posticos profunde foveatæ; prosternum antice sat elongatum, sat æqualiter convexum, in medio longitudinaliter nec carinatum nec depressum, ad pedum receptionem profunde utrinque excavatum; mesosternum breve fortiter transversum, antice truncatum; abdomen segmentis 5 (basali et apicali inter se subæqualibus) conformatum; suturæ ventrales bene impressæ; sterna utrinque ad pedum intermediorum et posticorum receptionem late profunde excavata; lamellæ abdominales segmenti basalis apicem attingentes, hujus cum margine apicali postice confusæ; tibiæ et femora valde compressa; hæc in facie inferiori ad illarum receptionem canaliculata; unguiculi appendiculati.

The combination of the following characters places this genus in the group *Bucolites* of Dr. Chapuis, viz.:—body pubescent, base of antennæ exposed, elytral epipleuræ with well-defined foveæ. Among the *Bucolites* the following combination will distinguish it, viz.:—ventral segments only five, abdominal plates incomplete, prosternum excavated to receive the front legs, tibiæ not dentate externally. It is also distinguished from all other genera of *Coccinellidæ* known to me by the structure of the legs, which have all their femora sulcate down the middle of their flat under surface for the reception of the tibiæ, in such fashion that when the femora are reposing in their cavities the tibæ and tarsi are entirely hidden beneath them, and each leg exactly filling its cavity, the general surface is quite level. In the example before

me the head is drawn into the cavity of the prothorax so closely and exactly that the front margin of the epistoma is in contact along its entire length with the front margin of the prosternum, and the oral organs (except the antennæ) are completely hidden; the structure in this respect resembling that of *Cryptolæmus*.

S. mysticum, sp. nov. Late ovale; sat convexum; nitidum; ferrugineum, piceo-umbratum; longe nec crebre albido-pubescens; supra fere impunctatum; subtus segmentis ventralibus antice subtiliter sparsim, postice crebrius subrugulose, punctulatis. Long., $1\frac{1}{5}$ l (vix); lat., $\frac{4}{5}$ l.

The general colour is a deep reddish-brown, the head and thorax pitchy, the general colour clouded vaguely with piceous about the suture and margins of the elytra and on the breast. The prothorax is rather small in proportion to the elytra; it is quite twice as wide as long; its front margin is sinuated behind the eyes; its sides are strongly rounded (somewhat angulated in the middle), and all its angles are rounded off; a delicate impressed line runs immediately in front of the hind margin. The superficial appearance is that of *Scymnus*. Under a very strong lens the prothorax shows some excessively fine puncturation; I cannot discover any on the elytra without using a microscope.

Port Lincoln; under bark of *Eucalyptus*.

BUCOLELLUS, *gen. nov.* [Bucolo affinis].

Corpus pubescens; caput prothoraci mediocriter insertum; antennarum brevium basis aperta; oculi sat magni, sat subtiliter granulati, intus subparallela; epipleuræ antice sat latæ subhorizontales, postice gradatim angustatæ et magis verticales, contra pedes intermedios et posticos profunde foveatæ; prosternum breve, sat æqualiter convexum, in medio longitudinaliter nec carinatum nec depressum; mesosternum sat magnum, antice truncatum; abdomen segmentis 5 (apicali præcedentibus 2 conjunctis longitudine æquali) conformatum; suturæ ventrales bene impressæ; lamellæ abdominales segmenti basalis apicem attingentes, hujus cum margine apicali postice confusæ; femora minus compressa; tibiæ sat graciles; unguiculi appendiculati.

This genus is certainly, I think, near to *Bucolus*, from which it differs chiefly in the shorter antennæ,* in the incomplete ventral lamellæ, and especially in the exceptionally short prosternum, this being in *Bucolus* exceptionally long.

B. ornatus, sp. nov. Breviter ovalis; pubescens; sat convexus;

* I have examined these under a microscope as well as possible without injury to the type, and find that they appear to consist of ten joints, but it is not possible to be quite certain without examination under more favourable conditions.

nitidus; ferrugineo-piceus; antennis, palpis, pedibus, prothoracis lateribus, et elytrorum signis nonnullis, testaceis; prothorace leviter sat crebre, elytris sparsius fortius, corpore subtus (segmento ventrali apicali excepto, hoc subtilius crebre subrugulose), punctulatis. Long., 1 l. (vix); lat., $\frac{4}{5}$ l. (vix).

The testaceous markings on the elytra are complicated and ill-defined, and probably variable. In the example before me on either elytron a wide vitta commences close to the humeral callus and runs obliquely towards the suture, but before reaching it turns hindward and runs parallel to the suture to a little distance short of the apex, where it becomes merged in the wholly testaceous colour of that part; in its hinder half its internal edge is bi-emarginate in such fashion that the dark sutural portion of the elytra appears to be twice dilated in its hinder half, and as a whole presents somewhat the outlines of a wineglass with a broad stem. On its external side the testaceous vitta in the hinder half is indeterminately dilated almost to the lateral margin, but some portion of this dilated portion is darker than other portions, so that there seems here to be a testaceous ground colour bearing some vaguely darker spots. The prothorax is about twice as wide as long; it is strongly emarginate in front, but not conspicuously sinuated behind the eyes; the sides are slightly rounded, the angles but feebly defined; the surface is more coarsely punctured near the lateral margins than in the middle.

A single specimen was sent to me from Western Australia by E. Meyrick, Esq.

BUCOLUS FOURNETI, *Muls.*

This species, omitted in Mr. Master's catalogue, although described originally on specimens stated to have been taken in Australia, is common in the neighbourhood of Adelaide. I have also taken it in the Port Lincoln district and in the Lake Eyre basin in the interior.

LIPERNES, *gen. nov.* (Bucolo affinis).

Corpus pubescens; caput prothoraci mediocriter insertum; antennarum basis haud aperta (?); clypeus cum genis superficiem ante oculos extensam efficiens; oculi magni subtiliter granulati, intus subparalleli; epipleuræ sat angustæ, postice gradatim angustatæ, apicem vix attingentes, contra pedes intermedios et posticos profunde foveatæ; prosternum antice sat breve, sat æqualiter convexum, in medio longitudinaliter nec carinatum nec depressum; mesosternum brevissimum (?) antice truncatum; abdomen segmentis 5 (basali et apicali inter se subæqualibus) conformatum; suturæ ventrales bene impressæ; lamellæ abdominales integræ

segmenti basalis apicem fere attingentes; pedes mediocres; tibiæ minus fortiter compressæ; unguiculi appendiculati.

The loss of the antennæ in my exponent of this genus is unfortunate; these members are very short, with the club proportionally large and the joints preceding the club very minute, so far I have been able to ascertain, but I destroyed the one antenna I had succeeded in distinguishing while trying to count the joints. There will, however, be no difficulty in identifying the genus without a detailed description of the antennæ. The clypeus and cheeks are continuous, and formed almost exactly as in *Orcus*. This character combined with the following will, I think, distinguish the genus from all hitherto named genera of *Coccinellidæ*, viz., anterior tibiæ simple, prosternum evenly convex in front of the anterior coxæ, ventral segments only five, body pubescent, epipleural foveæ very well defined, epipleuræ narrow (*e.g.*, much narrower than in *Bucolus*) and horizontal, legs not received in repose in sulci of the undersurface.

N.B.—I have not been able to satisfy myself as fully as I could wish regarding the structure of the mesosternum; indeed, I have failed to detect any suture between the meta and mesosterna under a fairly good microscope. It is just possible that an excessively fine suture may have escaped my observation, but I think it more probable that the suture is in contact with the hind margin of the prosternum, the mesosternum thus being (in part at least) vertical, and only observable by dissection. There is some approximation to such a structure in *Serangium* and other genera of *Coccinellidæ* where only a very short transverse strip of mesosternum is visible without dissection.

L. angulatus, sp. nov. Late ovalis; sat convexus; nitidus; piceo-niger, apicem versus obscure dilutior; capite prothoraceque subtiliter crebre, elytris paullo fortius sparsius, punctulatis. Long., 1 l.; lat., $\frac{4}{5}$ l. (vix).

The whole body is of a nearly uniform pitchy black colour, the elytra slightly paler towards the apex (perhaps only in occasional examples). The prothorax is about twice as wide as long, its sides very strongly deflexed so as to be almost vertical; the front margin is sinuated behind the eyes; its sides are but little rounded; its front angles though not at all sharp are fairly defined and rather prominent, its hind angles roundly obtuse; the base bears a fine impressed line close within the margin and is strongly convex (or widely lobed) all across the middle, being somewhat angular in front of the scutellum; the puncturation of the surface becomes coarser and subrugulose near the lateral margins where it is perhaps a little stronger than that of the

elytra. The pubescence is silvery, short, and sparse, but my example is certainly more or less abraded.

Near Port Lincoln. Obtained by sweeping low plants.

CYREMA, *gen. nov.* [Cryptogono affinis].

Caput prothoraci mediocriter insertum; antennarum basis aperta; oculi magni, minus subtiliter granulati, intus subparalleli; epipleuræ minus latæ, subverticales, postice gradatim angustatæ, contra pedes intermedios et posticos sat profunde foveatæ; prosternum inmedio longitudinaliter depressum, utrinque ad pedum receptionem excavatum; mesosternum transversum sat magnum, antice truncatum; abdomen segmentis 5 (basali et apicali longitudine inter se subæqualibus) conformatum; suturæ ventrales bene impressæ; sterna utrinque ad pedum intermediorum et posticorum receptionem excavata; lamellæ (abdominales segmenti basalis apicem attingentes, cum margine apicali postice confusæ) valde conspicuæ, concavæ; femora fortiter compressa; tibiæ minus validæ, anticis fortiter arcuatis.

The antennæ are very short, but I have completely failed to arrive at any certainty as to the details of their structure, so it is better to say nothing about them.* There is very little pubescence on my two specimens; probably, however, they both are more or less abraded. The genus would seem to be allied to several already described, but very distinct from all. The concave lamellæ of the under surface with their margins very strongly in relief, in the concavities of which the legs are contractile, together with the foveated elytral epipleuræ and the great development of the abdominal lamellæ, are suggestive of *Cryptogonus*, but on the other hand the mesosternum is well developed, and the ventral segments are only five in number. The form of the prosternum with a flattened longitudinal median space strongly narrowed from base to front, in combination with the characters mentioned above, will distinguish this genus from all others known to me. The claws are feebly appendiculate, and rather large.

C. nigellum, sp. nov. Late ovale; valde convexum; nitidum;

* The antennæ of some *Coccinellidæ* are very difficult to examine; owing to their minuteness and their concealed position it is often impossible even to break them off from a dry specimen successfully for microscopic study. Dr. Chapuis (Gen. Col. xii., p. 239) speaks of having uselessly sacrificed his unique example of *Cryptogonus* in the hope of furnishing information concerning the antennæ which the author of the genus had been unable to supply. I have to deplore a similar result of my study as regards one of my two specimens of *Cyrema*, and my unique exponent of *Lipernes* is none the better for my explorations in the region of its antennæ.

nigrum vel piceo-nigrum; capite prothoraceque subtiliter sat crebre, elytris multo fortius minus crebre, punctulatis. Long., $\frac{7}{10}$ l.; lat., $\frac{6}{10}$ l. (vix).

The head is wide, and flat between the eyes. Viewed from above the insect has quite the appearance of a *Chilocorus*. The prothorax is considerably longer down the middle than at the margins; across the base its width is more than twice its length down the middle; the front margin is strongly sinuous behind the eyes; the sides are widely, though very slightly, reflexed; the front angles are rounded, the hind angles obtuse. On the under side the meso-and meta-sterna are very finely and obscurely, and the ventral segments finely, closely, and strongly, punctured. The lamellæ under a powerful Coddington lens appear punctureless.

Two specimens occurred to me near Port Lincoln.

On the Occurrence of Coal Detritus in the Valley of the Murray.

By Walter Howchin, F.G.S.

[Read October 2, 1888.]

ABSTRACT.

The locality referred to is in the Hundred of Angas, about half a mile north of the South Rhine and three miles west from Rhine Villa. The superficial beds consist of alluvial brought down by the streams from the hills, which are but a quarter of a mile distant, the drift material being spread out as a low talus skirting the escarpment of the metamorphic rocks. The fragments of coal were first discovered at the surface, and were picked up in dry watercourses which had been cut in the superficial gravel beds. These fragments were noticed both in the loose material of the creek bottoms and also exposed in section of gravel beds along the two sides of the main creek.

The surface alluvium rests upon clay beds of much older date. There is first in descending order a reddish mottled clay about five feet in thickness, and beneath the latter a yellowish sandy clay of very uniform character and of considerable thickness. Messrs. Stoeckel brought up small fragments of coal from a bore in this clay at a depth of 80 feet, and the author found unmistakeable evidence of the presence of coal and carbonaceous shale at a depth of 110 feet, in a shaft sunk about 200 yards nearer the hills than the above-mentioned bore. This thick clay, in which the coal fragments occur, is apparently of lacustrine origin and of Tertiary age, and has been bared by the local streams after cutting through the superficial gravels.

The fragments of a carbonaceous character are mostly small, subangular, and of good quality. The shale, carrying strings of coal freely, bears a close resemblance to the coal shales of the Hunter River district, New South Wales. The appearance, which these coaly fragments present, indicates that they have travelled no great distance from the parent rock, which may be reasonably looked for within the limits of the Murray Valley. The depression of the valley of the Murray is no doubt of great geological antiquity, and whatever formations may have been deposited in this great depression since the early Primaries were raised and contorted (supposing that they were not entirely denuded prior to

the deposition of the Tertiaries) have been preserved from the effects of denudation by thick horizontal beds since the beginning of the Tertiary period.

The presence of rocks of intermediate age in Western Victoria is suggestive of the possibility of their extension under the great Tertiary plains of the Murray, whilst the existence of numerous inliers of granite, running in a line from the Murray Bridge to the Victorian border, may mark the course of an old ridge of Archæan rocks that acted as a barrier to the force of the sea, limiting the power of marine denudation in its effects upon the country lying to the north and east of this line. Provided the coal measures were deposited in the old archæan valley of the Murray, a barrier to seaward, such as that indicated, must have proved an important physical feature in favour of their preservation.

The conclusions, so far as they can be stated in relation to this interesting question, are as follows:—1. The presence of coal detritus in alluvial beds of an undisturbed character within the Murray basin cannot be doubted. 2. The carbonaceous fragments are not proper to the bed in which they are found; their lithological character and subangular shape prove them to be transported material dislodged from formations of an older date. 3. If the clay-bed in which the coal drift occurs be of Older Tertiary age (as supposed), it is extremely improbable that the fragments in question, which were highly mineralised when first washed into their present position, could be of so recent an age as Tertiary. 4. The proximity of rocks of coal-bearing age in Victoria, on the eastern boundaries of the great tertiary plain, points to a probable extension of these formations to the westward. 5. No hypothesis that would account for the presence of coal-wash in such a position is credible, except the supposition that these fragments have been derived from rocks of a like character *in situ*, which probably occur in patches of greater or less extent beneath the superficial formations, and will probably be found at no great distance from the spot where the first indications have been discovered. 6. So far as can be judged from small and somewhat weathered specimens, the coal, if found, is likely to be of commercial value should it occur in sufficient quantities.

List of Fungi Named by Dr. M. C. Cooke,

From Dried Specimens Collected near Lake Bonney by Miss Weihl, and from Coloured Drawings Prepared by her.

[Communicated by Baron Sir F. von Mueller, M.D., F.R.S., &c.]

Agaricus (Amanita) muscarius, *Fr.*
" (Lepiota) obclavatus, *C.* and *M.*
" (Lepiota) columbicolor, *C.* and *M.*
" (Armillaria) melleus, *Fr.*
" (Tricholoma) rutilans.
" (Tricholoma) melaleucus, *Fr.*
" (Clitocybe) infundibuliformis, *Fr.*
" (Collybia) veluticeps, *C.* and *M.*
" (Collybia) tylicolor, *Fr.*
" (Mycena) sanguinolentus, *Fr.*
" (Mycena) ætitus, *Fr.*
" (Mycena) speireus, *Fr.*
" (Mycena) hiemalis, *Fr.*
" (Omphalia) muralis.
" (Pleurotus) polychromus, *C.* and *M.*
" (Entoloma) læticolor, *C.* and *M.*
" (Entoloma) Bloxanii, *B.*
" (Entoloma) melaniceps, *C.* and *M.*
" (Clitopilus) cancrinus, *Fr.*
" (Flammula) vinosus, *Fr.*
" (Flammula) sapineus, *Fr.*
" (Flammula) fusus, *Fr.*
" (Flammula) crociphyldus, *C.* and *M.*
" (Galera) conocephalus, *Bull.*
" (Psalliota) coronillus, *Bull.*
" (Crepidotus) mollis, *Fr.*
" (Crepidotus) epigæus, *Batsch.*
" (Psathyrella) trepidus, *Fr.*
Boletus australis, *C.* and *M.*
Clavaria flava, *Fr.*
Peziza vesiculosa, *Fr.*
Scleroderma vulgare, *Fr.*
Geaster floriformis, *Vitt.*
Coprinus plicatilis, *Fr.*
Cantharellus politus, *C.* and *M.*

ABSTRACT OF PROCEEDINGS

OF THE

Royal Society of South Australia,

FOR 1887-88.

ORDINARY MEETING, NOVEMBER 1, 1887.

Prof. RENNIE in the chair.

BALLOT.—W. J. Phillipson was elected a Fellow.

EXHIBITS.—Mr. A. MOLINEUX showed an abnormal growth of a fungus.

PAPER.—"Drainage of Adelaide, and its Influence upon the Death-rate," by Dr. JAMIESON (Melbourne). A discussion followed, in which Drs. Whittell, Davies, Thomas, and Poulton, and Messrs. D. Gall, D. J. Adcock, and Prof. Rennie took part. It was moved, seconded, and carried that a special vote of thanks be conveyed to Dr. Jamieson. Prof. Rennie said that he considered it important that a record of the total number of typhoid cases, stating localities in which they had arisen, should be kept, and not alone of the deaths which occur.

ORDINARY MEETING, DECEMBER 6, 1887.

Prof. RENNIE in the chair.

BALLOT.—William Grasby was elected a Fellow.

EXHIBITS.—J. G. O. TEPPER, F.L.S., showed a number of galls and various fungi found upon eucalypts and other trees. By A. ZIETZ, very rare night lizard (*Nephrurus platyurus*); brown snake, which he believed to be *Diemenia microlepidota* (McCoy), from Sedan, caught by R. Rothe, first specimen found in the province; specimen of *Lygosoma Lissneurii*, from the Murray Scrub.

PAPER.—"Drainage of Adelaide and its Influence on the Death-Rate: a Reply," by H. T. WHITTELL, M.D. Dr. JAMIESON forwarded a note.

Ordinary Meeting, March 4, 1888.

W. Howchin, F.G.S., in the chair.

Ballot.—W. T. Angove, M.R.C.S., was elected a Fellow.

Exhibits.—By A. Zietz, natural history specimens obtained during a trawling expedition in the Gulfs of St. Vincent and Spencer on board H.M.S. Protector. By J. G. O. Tepper, a number of gem stones. By D. B. Adamson, photographs of the moon, these being the first taken in South Australia. By W. Howchin, F.G.S., some *Polytrema miniacea*.

Papers.—"List of Fungi from near Lake Bonney, S.A." (collected by Miss Wehl), by Baron F. von Mueller, K.C.M.G., &c., &c. "Nomenclature of the Australian Fauna," by Rev. Thos. Blackburn, B.A.

Ordinary Meeting, April 3, 1888.

Prof. Rennie in the chair.

Exhibits.—J. G. O. Tepper, F.L.S., various specimens of natural history.

Paper.—"Surface Features and Rocks of Nuriootpa and its Neighbourhood," by J. G. O. Tepper, F.L.S.

Ordinary Meeting, May 1, 1888.

Prof. Rennie in the chair.

Exhibits.—By A. Zietz, further collection of specimens from the dredging expedition on board H.M.S. "Protector;" *Typanocryptus pictus* from Port Lincoln. By Prof, Tate, F.G.S., micaceous rock, supposed to be the matrix of the gems found by the "Maud River Ruby Company." By Geo. Francis, a chart of spectroscopic lists of precious stones. By A. Molineux, oil made from the *Eucalyptus cneorifolia* and *Melaleuca uncinata*. By J. G. O. Tepper, F.L.S., binoxide of manganese from the Burra; a fibrous mineral from the Tasmanian tin-field.

Paper.—"The Composition of some so-called Australian Rubies," by Prof. Rennie, Sc.D., F.L.S.

Ordinary Meeting, July 3, 1888.

Prof. Rennie in the chair.

A letter from the Hon. Sec. (Prof. Liversidge) to the Australasian Association for the Advancement of Science was read, notifying that the date of holding the first General Meeting had been altered from September 4 to August 28, 1888.

Exhibits.—By A. Zietz, *Scorpæna bellicosa* (Castelnau), from St. Vincent's Gulf, previously known only from Nichol Bay,

Queensland; thus making the third species of *Scorpæna* for South Australia, namely *S. cruenta*, *S. panda*, *S. bellicosa*. *Pentorage marmorata*. *Brachyiorophis*, sp. (?), from Port Augusta, possessing a large rostral shield, with a sharp anterior edge and a markedly short tail. *Hoplocephalus Gouldii*, from Port Augusta, being the first specimen with proper locality recorded for South Australia (Macleay's "Census for Australian Snakes" gives West Australia as the habitat). *Xanthosia murigena* (found in the pearl oyster), from Western Australia. *Harpilius*, sp. (?) (a small crustacean found domiciled in a pearl oyster), with rostrum rounded and smooth above, instead of being serrated as in other long-tailed crustaceans. *Periophthalmus Roelrentheri*, from Western Australia (a new locality). Abnormal form of a species of ray, without eyes or fins; species undetermined; presented by Mr. Kemp, Glenelg. Three remarkable sponges, from Western Australian pearling station, presented by Capt. Reddall, namely *Tanthella australis*, *Tethyana ramosa*, *Reniera*, sp. (?). By J. G. O. Tepper, F.L.S., collection of South Australian Apidoptera, comprising nearly all the known species; also a specimen of *Lebeda* (one of the *Bombycidæ*), which feeds upon eucalypts in the South-East of South Australia, and spins a very large cocoon, which might possibly be of commercial value.

Papers.—"Some New Coccidæ from South Australia," by W. M. Maskell, New Zealand, communicated by Frazer S. Crawford; illustrated. A special vote of thanks was accorded to Mr. Maskell. "An Automatic River-Gauge," by Thomas Parker, C.E.

Ordinary Meeting, August 7, 1888.

Prof. Rennie in the chair.

Ballot.—Oswald Lower was elected a Fellow.

Paper.—"Sponges of Australia," by A. Zietz.

Ordinary Meeting, September 4, 1888.

Dr. Whittell in the chair.

Ballot.—Mr. N. Maskell, New Zealand, was elected a Corresponding Member. Robert William Chapman, B.A., was elected a Fellow.

Exhibits.—By J. G. O. Tepper, F.L.S., some mineral specimens. A rare fungus, forwarded by Miss Hicks. By W. T. Angove, M.R.C.S., two honey eaters, namely, *Myzomela nigra* and *Dicæum hirundinaceum*.

Papers.—"List of Snake-like Lizards observed in South Australia," by A. Zietz. "Notes upon a New Australian Mammal," by E. C. Stirling, M.D.

W. B. Poole was elected Auditor.

Annual Meeting, October 2, 1888.

Prof. Rennie in the chair.

Mr. Frazer Crawford introduced to the President Mr. Albert Koebele, the Assistant Entomologist for the United States of America, who was present as a visitor.

Exhibits.—By J. G. O. Tepper, F.L.S., a complete list of South Australian *Buprestidæ*. By Mr. D. J. Adcock, specimen of *Voluta Adcocki* from Encounter Bay.

The annual report and balance-sheet were read, adopted, and ordered to be printed.

The annual reports and balance-sheets of the Field Naturalists' and Microscopical Sections were read and accepted.

Mr. J. G. O. Tepper, F.L.S., gave notice that at the next meeting of the Society he would move—"That the recommendations made by the Field Naturalists' Section with regard to the better protection of the native fauna and flora be adopted by this Society."

Election of Council.—The nomination and election of officers for the ensuing year was as follows:—President, Prof. Rennie, D.Sc., F.C.S.; Vice-Presidents, H. T. Whittell, M.D., and E. C. Stirling, M.D.; Hon. Treasurer, Walter Rutt, C.E.; Hon. Secretary, W. L. Cleland, M.B.; Members of Council, Prof. Tate, F.G.S., W. B. Poole, Charles Todd, C.M.G., M.A., W. Howchin, F.G.S., D. B. Adamson, Rev. Thos. Blackburn, B.A.

President's Address.—Prof. Rennie, D.Sc., gave an address on the "Relations between Chemical Science and some Colonial Industries."

Papers.—"On Australian Coleoptera, with Descriptions of New Species," by Rev. Thomas Blackburn, B.A. "On the Occurrence of Drift Coal in the Valley of the Murray," by W. Howchin, F.G.S. "Gastropods of the Older Tertiary of Australia, part II.;" "Additions to the Lamellibranchiata of South Australia, with Descriptions of New Species;" "Additions to the Flora of Port Lincoln;" "Plants of the Lake Eyre Basin;" "Definition of New Species of Plants;" "A Census of the Molluscan Fauna of Australia;" "Descriptions of New Genera and Species of Australian Mollusca," by Prof. Tate, F.G.S.

ANNUAL REPORT.

Tho Council has the pleasure of reporting that the work of the Society has been carried on successfully during the past year. The following papers have been laid before the Society :—"The deep drainage of the City of Adelaide and its influence on the death-rate of the city," by Dr. Jamieson, of Melbourne ; "Reply showing certain fallacies in Dr. Jamieson's paper," by Dr. Whittell ; "List of fungi collected near Lake Bonney by Miss Wehl," by Baron. v. Mueller ; "On the Nomenclature of Australian Fauna," by Rev. Thos. Blackburn, B.A. ; "Surface features of the District of Nuriootpa," by J. G. O. Tepper, F.L.S. ; "On the composition of so-called 'Australian Rubies,'" by Prof. Rennie, D.Sc. ; "Description of an automatic River Gauge," by Thos. Parker, C.E. ; "On the Sponges of Australia," by A. Zietz; "List of Snake-lizards in South Australia," by A. Zietz ; "Some new Coccidæ of South Australia," by W. M. Maskell, of New Zealand ; "Description of a new mammal," by E. C. Stirling, M.D. ; "On Australian Coleoptera, with descriptions of new species," by Rev. Thos. Blackburn, B.A.; "Gastropods of the Older Tertiary of Australia, Part II.," by Prof. Tate, F.G.S.; "Additions to the Lamellibranchiata of South Australia," by Prof. Tate, F.G.S. ; "Additions to the Flora of Port Lincoln," by Prof. Tate, F.G.S. ; "Plants of the Lake Eyre Basin," by Prof. Tate, F.G.S. ; "Definitions of new species of Plants," by Prof. Tate, F.G.S. ; "A Census of the Molluscan Fauna of Australia," by Prof. Tate, F.G.S. ; "Description of new Genera and Species of Australian Mollusca," by Prof. Tate, F.G.S. ; "Remarks on the Coal-drift on the Murray Flats," by W. Howchin, F.G.S.

During the year there have been presented to the notice of the Fellows and members many new and interesting exhibits of natural history, chiefly procured by J. G. O. Tepper, F.L.S., and A. Zietz. The Council has much pleasure in noticing that an attempt was made during the year to utilise the services of the S.S. "Protector" in dredging some of the deeper portions of the seas adjacent to our coasts. The results were eminently gratifying, as shown by some of the rare and unique specimens that have already been exhibited. It was also a matter for congratulation that these dredgings were under the scientific direction of Mr. A. Zietz, assisted by Dr. Stirling, who was fortunately able to accompany the expedition. Amongst other exhibits may be mentioned a night-lizard (*Nephrurus platyurus*) by A. Zietz ; *Diemenia microlepidota* from Sedan, by A. Zietz, being the first

specimen known to occur in the Province. Photographs of the moon by D. B. Adamson, this being the first attempt to take them in South Australia. *Polytrema miniacea*, by W. Howchin, F.G.S. Portions of a new mammal found in Central Australia, by A. Zietz.

The membership of the Society consists of 120 Fellows, 11 Hon. Fellows, 15 Corresponding Members, and two Associates.

During the year five new Fellows have been elected and one Corresponding Member, W. M. Maskill, F.R.M.S. It is with much regret that your Council has to record the death of one of the most senior Fellows, namely, Mr. David Gall. Although Mr. Gall did not contribute much that was new to science to the Proceedings of the Society, yet he was a Fellow that the Society could ill afford to lose, for his attendance at the meetings was most regular, and his intelligent and sympathetic appreciation of all pertaining to science made his presence most encouraging to those who had exerted themselves to bring forward objects for description or exhibition. In the promptness and regularity with which Mr. Gall paid his annual subscriptions, it is evident that he looked upon this act as one of the most important pertaining to the duties of a Fellow, recognising the fact that it is only by this means that much costly and invaluable scientific work can be perpetuated in the scientific proceedings of a learned society.

On this account your Council has viewed with much concern the receipt of numerous resignations of Fellows during the past year, on the plea that distance or other engagements prevented their attendance at the Society's meetings. The absence of these gentlemen from the meetings is regrettable, but it is much more to be deplored that the absence of their subscriptions will materially curtail the usefulness of the Society in recording scientific facts. This action is also the more unfortunate at the present time, when the Association for the Advancement of Science has been started, as Fellowship of one of the learned Societies meant *ex officio* membership of the Association on the payment of the subscription.

Your Council has also with much regret to report the loss by resignation of one of your Vice-Presidents, Mr. R. L. Mestayer, C.E., F.R.M.S., his professional duties having caused him to leave the Province. Your Council finds that not only has the Society suffered a loss by his unavoidable departure, but that the management of the affairs of the Society has experienced a deprivation in losing his uniformly sound and intelligent advice.

The reports of the two Sections of the Society, namely, the Field Naturalist and Microscopical Sections, show that they continue to thrive and to do excellent work preparatory to undertaking more arduous scientific labours, and are thus enabling

their members how to become ultimately working Fellows and leaders in the parent Society.

During the past year the library has been enriched by numerous additional works and the proceedings of the various scientific Societies. Amongst other books may be mentioned the "Iconography of Australian Species of Acacia and Cognate Genera" (eight decades), by Baron v. Mueller; "Descriptive Catalogue of the Medusæ of Australian Seas," by B. von Lendenfeld; "Bulletin of the Museum of Comparative Zoology, Harvard College;" "Fourth Annual Report of the Bureau of Ethnology, Smithsonian Institute;" "The U.S. Geological Surveys, Monographs;" and the "Eucalypts of Australia," by Baron v. Mueller.

The Council has continued to authorise the execution of more plates to illustrate the second part of Prof. Tate's paper on the "Gastropods of the Older Tertiary of Australia." It is a matter for congratulation that Prof. Tate's labours have enabled the Council to expend the money in so advantageous a manner.

Your Council also thinks that it is matter for great satisfaction that one of our Fellows (Dr. Whittell) was able from his position as President of the Central Board of Health, to completely disprove the opinion advanced by Dr. Jamieson, of Melbourne, viz., that the deep-drainage of the City of Adelaide was not the success it was thought to be as a factor in diminishing the mortality rate. Not only is the matter an important one to the City of Adelaide itself, but also as helping to strengthen the hands of the Executive in places not yet provided with the same admirable system.

The Council has deemed it advisable to cause certain volumes of the Society's "Proceedings" (Nos. 1, 5, 6) to be withdrawn from sale on account of the limited number of copies on hand. In future these volumes will not be parted with, unless the special permission of the Council has been obtained. A uniform price has also been fixed for the other annual volumes, which can always be obtained from the Secretary.

The Council cannot refrain from alluding to the fact that the first meeting of the Australian Association of Science, lately held in Sydney, has now become a matter of history. It is also gratifying to note that the various Fellows of this Society took a prominent part in the inaugural proceedings, Prof. Rennie being a Vice-President, Prof. Tate the President of the Biological Section, and Prof. Bragg holding the important position of representative delegate on the Council.

The Society will be pleased to note from the Hon. Treasurer's statement that the receipts this year have been larger than for any previous one.

PRESIDENT'S ADDRESS.

Professor Rennie read his annual Presidential address as follows :—

It is with feelings of some regret that I am here this evening to deliver the annual address as President of the Royal Society of South Australia ; regret, I mean, that I have not been able to do so much as I would like to have done to promote its interests. My failure to do more has arisen partly from the multiplicity of other duties to which I have been obliged to give attention during the past two years, and partly from the fact that the subjects dealt with by the Fellows who have come before us here have been for the most part connected with a department of science with which I am far from familiar, viz., Natural History. This must always be more or less a principal subject with a young Society in a new country. It is therefore with great satisfaction, I think, that we should welcome as two new members of council for the ensuing year two gentlemen who are zealous students of the natural sciences, and to one of whom the Society owes a great deal of what success has attended its meetings, if not its actual existence, in past years.

Turning now to those matters on which I am to address you this evening, let me say first that I had considerable difficulty in the choice of a subject, scarcely knowing what would prove most interesting to this audience. It has very appropriately been the custom on similar occasions to give some account of the advances made during the past year or years in the subject with which the speaker is most familiar, but in this case such a course would have necessitated such an account of the more abstruse portions of chemistry as could scarcely have been condensed into the limits of such an address as this, even if they proved of sufficient interest to the majority of my hearers.

After some deliberation I have decided to say a few words on the present state of some of those industries of these colonies in which chemical science is more or less involved, and in some cases to suggest what seem to me to be the possibilities of economy and development in the future. I do not claim originality, nor do I claim to be in a position to discuss fully all the circumstances of each case, but simply venture to hope that by drawing attention to certain facts some few may be induced to think over the possibilities of future improvement, and, perchance, to take steps to bring about practical advances in our industrial processes. If some of

the suggestions should be proved to be impracticable owing to local circumstances, at least no harm can be done by having them under discussion.

AGRICULTURAL AND PASTORAL.

What is the condition of affairs in this colony? Is the yield of wheat anything like what it used to be? On all sides we hear statements of the great differences between the yields of earlier and later years. It goes without saying that a great deal depends upon the rainfall. Nothing can be done without water, and it is a matter of satisfaction that the settlers in the colonies are gradually becoming alive to the absolute necessity for better water conservation. But given fair average seasons, how is the falling-off in the crops to be accounted for? The obvious answer is—Exhaustion of the soil. But what are its causes, and are there any remedies? Every year sees the export from this colony of thousands of tons of wheat, to say nothing of other cereals. Now every ton of wheat contains on an average about 18 lb. of phosphorus oxide and 7 lb. of potash. Both of these substances in certain forms of combination are essential elements in a fertile soil; but they are only present in very small quantities even in the best land. Besides this a not inconsiderable quantity of potash is carried off with all the unwashed wool that leaves our shores. If this is to go on without some compensation the yield of cereals, grasses, &c., must inevitably become smaller and smaller, and the crops will be rendered more liable to be attacked by parasitic diseases. Deeper ploughing will do something for a time, but only for a time; something more is necessary. In many cases, I fear in most cases, nothing is being done to make up for the loss. Nothing in fact can be done, except by the addition of natural or artificial manures and systematic farming. This, of course involves careful preservation of all materials which can in any way be applied to manurial purposes. In this last respect there is great want of care. If anything successful is to be done with working men's blocks and such comparatively small tracts of land as are likely to be benefited by the Beetaloo and such like irrigation schemes, careful cultivation is absolutely necessary, for water alone will not supply all that is needful for the growth of crops. What are the facts in most cases? Little or no care is taken to utilise farmyard manure to the best advantage, yet this is a form of manure eminently adapted for most purposes, containing as it does nitrogen compounds and phosphates in a form especially suitable for assimilation by plants. Wood ashes, which contain a considerable proportion of potash salts, and of which a not inconsiderable quantity is produced every year in every farm-house, are thrown out anywhere and everywhere. The same is true of bones. With a little extra trouble they could be all burnt,

adding thereby very materially to the value of the ashes; or, better still, by a cheap mill they could be ground to bonedust and so give nitrogen as well as phosphates to the soil. The quantities of phosphates, nitrogen, and potash salts obtainable from the above sources would not be sufficient to replace the loss on a large farm, but they would do something towards it, and would certainly be of considerable use in increasing the produce of the orchard or vegetable garden. Quantities of bones, bonedust, and superphosphate are being from time to time exported from the colony. Surely this is a needless sending away of valuable manure. It seems to me there must be something very seriously wrong somewhere when such valuable materials can be exported from such a colony as this at a profit. Then, again, there is sulphate of ammonia, a most valuable manure in some cases. There is so little sale for this, now that the Mauritius market has failed, that the Gas Company are hesitating whether to continue the manufacture. Yet it is obtainable at a reasonable price, and not a pound of it should be allowed to leave the colony. There is strong evidence of want of thrift and economy among a large proportion of our rural population. The days are gone in which crops could be obtained by merely scratching the surface of the soil. Every day it is becoming more manifest that careful and economical treatment is necessary to make the land yield any kind of produce continuously. The much persecuted Chinaman is certainly a pattern in this respect. He has come from a country where the very existence of the population depends to a large extent upon the proper treatment of the land, and he has learnt the lesson well. He takes good care that nothing is wasted, and he obtains results accordingly. Possibly something may be done by training the children in our schools, country schools in agricultural districts especially, in such a way as to make them practically acquainted with such matters, and by endeavouring to foster in them a liking for agricultural pursuits. Is it not desirable that experiments should be undertaken with a view of discovering what are the best methods of farming in this colony under varying conditions? In England, in various parts of Europe, and in America there are large experimental farms, established either by the Government or by private enterprise, in which such experiments can be carried out on scientific principles. The results obtained by years of painstaking investigation at the experimental station carried on by Messrs. Lawes & Gilbert at Rothamstead have proved invaluable all over the world. Associated with these stations in many cases are well-equipped Agricultural Colleges. What have we here? An Agricultural College, it is true, but very insufficiently equipped internally as regards the appliances for proper scientific teaching, of even an

elementary character, to say nothing of investigation, and externally with one of the worst pieces of land in the whole district, and besides all that with an endowment utterly inadequate for effectively carrying out experiments such as have been alluded to. Reference has already been made to the fact that potash salts are carried off with all the unwashed wool that leaves our ports; but apart from this no effort is made, so far as I know, to preserve for manurial purposes the potash salts which find their way into the water in which wool is washed. Professor Tate drew attention to this matter some ten years ago in some science notes communicated to the *Register*. The greasy matter of wool is composed of certain peculiar fatty substances, some fatty acids, and potash salts in the form of soaps. These latter find their way into the wash-water, and here are simply wasted; but in Europe the water is evaporated, the residue calcined in gas retorts, yielding by that treatment considerable quantities of ammonia and illuminating gas, and the charred product washed to extract the potash salts, which are obtained in a form readily convertible into valuable manure. A process has recently been patented in this colony, of which a trial took place some time ago, for extracting the potash salts from wool by water, and the greasy matter by carbon disulphide. The patentees have proceeded to England with a view of perfecting certain parts of the apparatus, which cannot be obtained here. The use of carbon disulphide for extracting greasy matters is not new, but has been tried more than once and abandoned owing to various difficulties connected with its use. Possibly, however, the new process involves improvements which will render the process workable and profitable. The value of the greasy extract depends mainly on one of its constituents, a substance known as cholesterin, which is found in human gall-stones, in feathers, hair, whalebone, &c., and which possesses the peculiar property not possessed by ordinary fats of absorbing more than 100 per cent. of water. Mixed with a certain proportion of water it is known as lanolin, and this substance is stated to be much more valuable for making plasters, ointments, &c., than vaseline, paraffin, or lard, being much more readily absorbed by the skin, carrying with it the various medicaments with which it may be mixed. Again, potash salts are sometimes carried off in some quantity in the "argol" or "tartar" which separates from grape juice during fermentation. This substance is known chemically as potassium bitartrate, and is in many cases sold to chemists for the manufacture of cream of tartar, and for other purposes. It is not impossible, however, nay, it is highly probable, that a continual draining off of this compound from the soils of our vineyards without corresponding replacement may produce damaging effects.

hereafter. We may safely take it for granted that the invariable presence of considerable quantities of the substance in the fruit has some intimate connection with the healthy growth of the vine.

FOREST CONSERVATION.

In the matter of forest conservation we are well off in this colony, and our energetic Conservator of Forests has achieved great success in this direction. You will have noticed that he is proposing to supply a large quantity of charcoal for use at Broken Hill. This means a large waste of by-products if it is to be made by the old method of burning. Mr. Brown informs me, however, that he is thinking of introducing the system of carbonizing in retorts, and so preserving the liquid products, which are of considerable value, containing as they do creosote, pyroligneous acid, and wood spirit. For all of these there is some demand. There is great need of a supply of the latter article of good quality for methylating purposes, the material imported for that purpose being wretched stuff, containing a considerable quantity of hydrocarbons, which are immediately precipitated on dilution with water. The Conservator also contemplates the production of turpentine from the pine forests, which are growing successfully in some of the northern parts of the interior. I am sure you will welcome these advances in utilization of our own products.

PRODUCTION OF TANNIN.

Another subject connected with one of the products of the colony is the production of tannin from the bark of the various species of acacia. This scarcely seems to be attracting the attention it deserves. A great deal remains to be done in the direction of ascertaining the best varieties of wattles which will flourish under different conditions, and above all of ascertaining at what stage of growth it is most advantageous to strip the tree, or cut it up into fragments, as is now done at Messrs. Barrow & Haycraft's establishment at Echunga. There has, however, been needless waste in the ruthless destruction of young trees which would have yielded much more tannin had they been allowed to grow for a year or two longer. If the demand increases, as it is certain to do (unless indeed some cheap substitute for tannin be found), there will probably be a difficulty in supplying the demand. Putting in a few wattle seeds now and again on spare land does not involve a large amount of time or labour, and many a landholder might add to his income in the future by a judicious and systematic planting of this useful tree. Some very valuable investigations on Australian tannin-yielding trees, and the percentage of tannin they contain, have been recently published by Mr. G. H. Maiden, Curator of the Technological Museum in

Sydney, in the Proceedings of the Royal Society of New South Wales. Mr. Maiden is still pursuing his energetic labours in this direction, and further results will, I understand, soon be published.

OIL-YIELDING PLANTS.

The cultivation of certain oil-yielding plants may yet yield good results. Olive oil has for some years been successfully produced in South Australia. It is a splendid article, and is deservedly commanding an increased sale. There is, I am told, some prospect of a trial being made with castor oil. For this oil there is a considerable demand, and, judging from the facility with which the tree grows, there seems no reason why it should not be successfully cultivated. There were some good specimens of sesame and peanut oil from the Northern Territory shown at the Exhibition last year. From this I gather that the plants yielding those oils grow well in that district. Then again there are doubtless many indigenous trees capable of yielding valuable products, medical or otherwise, but the investigation of such matters requires long and patient labour, and there are few workers in the field.

METALLURGY.

So long as metallurgical processes are conducted on a small scale, as they are at present, little can be done that has not already been done in the matter of economy. In older countries large metallurgical works, such as those at Freiberg, include a large number of different processes, yielding different products, and all help to contribute to their success. Here the great difficulty seems to be to obtain a market for many of the products. For example, in connection with the extraction of gold from pyrites, the latter can be burned in suitably constructed kilns, and the sulphur dioxide so produced utilised in the manufacture of sulphuric acid, the residue being in a condition suitable for extraction of gold by amalgamation. But most samples of pyrites contain arsenic, which can only be partially condensed, though it often is condensed in Europe and preserved for various purposes. The sulphuric acid from the pyrites therefore becomes contaminated with arsenic, and would not command such a ready sale for some purposes as the purer article, though it might be applied in many cases just as well as the purer acid. The great difficulty is that more acid would be produced than there is a market for. But may it not be possible in some instances to combine with the manufacture of sulphuric acid from this source other processes in which the sulphuric acid could be utilised? At Mount Morgan I am credibly informed that it is intended to make the sulphuric acid and chloride of lime used in the Newberry-Vautin chlorination process. If this be the case I am not

without hopes that something may yet be done in a similar direction with ores far less rich than those of Mount Morgan. In cases where the pyrites contain small percentages of copper it is possible sometimes to extract this economically by the wet process by the aid of sulphuric acid. There are many other possible ways in which the acid might be utilised, but the success of any one of them would depend largely on local circumstances. We have heard something lately of so-called paint mines. By these are meant of course deposits of coloured oxides of iron which can be manufactured into paints. At Ballarat the residues after roasting iron pyrites and extraction of the gold are now being utilised for this purpose, the oxide of iron being in a very fine state of division and of sufficiently good colour to command a sale. Reference has been made to the preparation of chlorine for the extraction of gold. In the chlorination process chloride of lime is used as the source of chlorine. Now this substance in solution is generally regarded as a mixture of calcium chloride and hypochlorite, but whatever view be held as to its nature, less than half its weight is chlorine available for the purpose of gold extraction. Is it not somewhat anomalous that the chlorine should first have to be prepared in Europe, then converted into chloride of lime, of which remember less than half the weight is chlorine, then imported to Australia, with very often a considerable loss of chlorine before it is actually used. It will perhaps be said that all this is compensated for by convenience in working and saving of time and labour where this substance is used, the direct use of chlorine involving extra plant, and perhaps more wear and tear. Be this as it may, there still seems to me to be matter for reflection for those concerned. A suggestion has been made to use bromine water instead of chlorine gas, the bromine being of course all recovered and used again. The obstacle here would be the shipping difficulty, bromine being a dangerous substance to deal with if a breakage should occur. In appliances for gold-saving by amalgamation the necessity for bringing the mercury into intimate contact with the finely divided gold is becoming more and more apparent. Attempts have been made with more or less success to effect this by means of grinding machinery, but lately a process has been patented which presents some new features. The roasted auriferous ore in a fine state of division is brought by means of a powerful blast in contact with the vapour of boiling mercury. It is claimed that by this means a very perfect amalgamation takes place, the mercury condensing and taking the gold down with it. It is claimed that the process can be made continuous by using the same mercury over again. It is an ingenious idea, but one of the difficulties, it seems to me, will be the loss of mercury by oxidation, caused by contact of the

oxygen of the air with the hot vapour of the metal, it being a well-known fact that mercury in contact with oxygen at a high temperature becomes oxidized. In silver smelting greatly improved results are now obtained as compared with those of a few years ago, doubtless owing to the employment of skilled metallurgists, but that there is a considerable loss of lead is evidenced by the fact (if evidence were wanting) that a large number of persons at Broken Hill show some of the minor symptoms of lead-poisoning. In Europe great efforts are made to condense lead fumes as completely as possible, so as to recover the metal. Probably enough it would not pay to erect condensing flues for this purpose at such places as Broken Hill, but the fact remains that there is waste, and such waste as might make a considerable difference in large works employed in smelting poorer ores, and may we not hope to see metallurgical processes so carried out in Australia in the future as to render possible the profitable treatment of such poorer ores.

CHEAP SALT.

Closely connected with the possibility of preparing chlorine by a paying process is the production of cheap salt. Surely there should be little difficulty about that. For this purpose the salt need not be purified at all, but the residue from sea water or salt lakes used just as it is, and in the hot dry parts of this colony near the seacoast large quantities of sea water could be evaporated at a very small outlay. Moreover, I cannot see why good salt for table and other domestic purposes should not be manufactured in quantity as it is on the shores of the Mediterranean by the aid of the sun's heat alone. If there is a prejudice against colonial articles there must be some cause for it. Probably the sending into the market of carelessly manufactured and imperfectly purified products has had a good deal to do with it; and in this particular instance the evaporation of sea water needs to be carefully carried out to produce a good marketable article, while that salt obtained from salt lakes, the result of inland drainage, is sure to contain considerable quantities of magnesium compounds, which will render it bitter and unsuitable for domestic use, unless means are taken to remove these objectionable substances. If our colonial manufacturers are to succeed it is absolutely necessary that good articles should be produced.

ECONOMY IN THE USE OF GAS.

In recent years a great deal has been done in the direction of economizing fuel in large works requiring the use of powerful furnaces. It is well known that the gases which escape from ordinary closed furnaces are not completely burnt. The complete combustion of these gases is now effected by introducing under certain conditions a secondary supply of air, this air being

itself heated by the final escape gases from the furnaces. This secondary combustion gives a very high temperature, and is the means of an enormous saving of fuel. The combustible gases may also be increased in quantity by causing a small quantity of steam to pass through the primary furnace, and the necessary quantity of steam can be obtained by means of the heat from the spent gases. This principle has been successfully applied by the manager of the gasworks at Bowden, a bed of retorts being heated entirely by the secondary combustion of the half-burnt gases from one of the ordinary furnaces. It is obvious that the principle is capable of very extensive application. A somewhat similar principle applies to economy in the use of gas for illuminating purposes. The contrivances for this purpose are so arranged that the gas is heated to a high temperature before it reaches the mouth of the burner by means of the heated gases resulting from its own combustion. It is well known that under these conditions a very much better light is obtainable with the same consumption of gas. There are various types of burner constructed on this principle, but they are not easily adaptable to the rooms of an ordinary dwelling-house. They are, however, well suited for lighting large spaces. They were in use in Holborn before I left London, some five or six years ago, and I notice that one form has been introduced into some few of the shops in Adelaide. In this connection it may not be out of place to mention the greatly improved simple burners (Sugg's for example), which are easily obtainable at a moderate price, and can be easily fitted in place of the wretchedly dim older-fashioned burners. A great deal better light can be obtained by their means with a smaller consumption of gas.

CONCLUSION.

Fortunately, or unfortunately, we have not yet in these colonies reached that stage of our history in which rigid economy in industrial and manufacturing processes and utilization of all waste products becomes a necessity. It is a matter of history in Europe that in some instances what were originally regarded as waste products have become, if not the principal objects of manufacture, at least those upon which the success of the undertaking, from a commercial point of view, depends. At some future time this may be the case here ; at any rate, it is always useful to keep in mind the fact that materials, valuable in themselves, are neglected, because it is always possible that the knowledge that such is the case may stimulate to discoveries of new processes for their utilization."

On the motion of Professor TATE, seconded Mr. TODD, Professor Rennie was thanked for his address, which was referred to in terms of the highest praise.

Mr. Todd said it would be of great value to the country.

Mr. T. Parker, C.E., referred to the assertion that the water in some of the rivers was said to be unfit for irrigation owing to the presence of saline matter. He had known land to thrive after this water had been on it, and he wondered whether the saline matter had not manuring properties. The Society might properly investigate the question.

Professor Rennie said that in certain cases it was difficult to say positively that water was unfit for irrigation unless an actual trial proved it to be so.

Mr. Todd mentioned that around the mountain springs at Hergott and Strangways the country was very destitute. On the other hand, the country around the artesian bore at Strangways was in better condition.

Mr. Tepper said the use of saline water was more successful on sloping ground, where the saline matter would not remain.

The following papers were presented :—By the Rev. T. Blackburn, "On Australian Coleoptera, with descriptions and new species;" by Prosessor R. Tate, F.G.S., "Gastropods of the Older Tertiary of Australia, Part II.," "Additions to the Lamellibranchiata of South Australia," "Additions to the Flora of Port Lincoln," "Plants of the Lake Eyre Basin," "Definitions of New Species of Plants," "A Census of the Molluscan Fauna of Australia," "Description of new Genera and Species of Australian Mollusca;" and by Mr. W. Howchin, F.G.S., "On the Occurence of Coal Drift on the Murray Flats."

THE TREASURER IN ACCOUNT WITH THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Dr.	£	s.	d.	£	s.	d.
October 1st, 1887.						
To Balance brought forward ..				260	14	11
" Subscriptions—Royal Society ..	106	11	6			
Field Naturalists' Section	20	0	0			
Microscopical Section ..	14	6	6			
				140	18	0
" Government Grant				66	13	0
" Interest				9	6	0
" Sale of Transactions				3	13	6
				£481	5	5

Cr.	£	s.	d.	£	s.	d.
By Cost of Transactions—						
Printing and Binding ..	117	12	10			
Illustrating (£31 10s. included in last year's accounts) ..	3	3	0			
Editing and Publishing ..	4	15	1			
				125	10	11
" Salaries, &c.—						
Assistant Secretary	21	0	0			
Attendant	1	7	0			
Collector	3	11	6			
				25	18	6
" Advertising				5	9	1
" Printing, postage, stamp tax, and stationery				11	4	4
" Field Naturalists' Section—Grant ..	25	0	0			
Printing Prize List	1	0	0			
				26	0	0
" Microscopical Section—Grant ..				18	0	0
" Library—Binding	5	19	0			
Cupboard	6	5	0			
				12	4	0
" Balance—Bank of South Australia..	60	14	8			
Savings Bank.. ..	196	3	6			
Cash in Treasurer's hands ..	0	0	5			
				256	18	7
				£481	5	5

Audited and found correct.
W. B. POOLE, Auditor.
September 30, 1888.

WALTER RUTT, Treasurer.

DONATIONS TO THE LIBRARY

For the Year 1887-8.

I.—Transactions, Journals, and Reports.

Presented by the respective Societies, Editors, and Governments.

Batavia—Naturrkundig-Tijdschrift voor Netherlands-Indie; Proceedings, Deel XLVII.; Achtste Serie, Deel VIII.

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Belfast (Ireland)—Report and Proceedings of the Belfast Natural History and Philosophical Society for 1886-7, Nos. 20 to 25 (1887).

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———— Hints for the Preservation of Specimens of Natural History. E. P. Ramsay, F.R.S.E., &c.

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———— Catalogue of the Australian Hydroid Zoophites. W. M. Bale.

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Victoria—The Victorian Naturalist; vol. IV., Nos. 7 to 12; vol. V., Nos. 1 to 6.
By the Victorian Government:—
——— Iconography of Australian Species of Acacia and Cognate Genera. By F. von Mueller. Decades 1 to 12.
——— Podromus of the Zoology of Victoria. By Fredk. McCoy. Decades 1 to 16.
——— Victorian Year-Book for 1886-7.
——— Eucalyptographia (Eucalypts of Australia). Ninth Decade. F. von Mueller.
——— Victorian Engineer; vol. III., No. 3.
——— Transactions and Proceedings of the Royal Society of Victoria; vol. XXIV., part 2.
——— Transactions of the Geological Society of Australasia; vol. I., part 3.
Vienna—Kaiserlich Akademie der Wissenschaften in Wien. Jahrg, 1887. Sitzung der Mathematisch-naturwissenschaftlichen Classe; Nos. 20 to 28, and index; Jahr, 1888; Nos. 1 to 12, 14 to 19.
——— Verhandlungen der K. K. Geologischen Reichenstalt, 1886, Nos. 5, and 13 to 18; 1887, Nos. 1, 6, 17, 18; 1888, Nos. 1, 2, 3, 4, 7, 8, 10, 11.
——— Verhandlungen der K. K. Zoologisch-botanischen Gesellschaft in Wien; vol. XXXVI., parts 3, 4, 9.
Warsaw—Langue Internationale. Preface et Manuel complet. By Dr. Esperanto.
Washington—Circulars of Information of the Bureau of Education, No. 1; 1887, No. 2.
——— Scientific Writings of Joseph Henry; vols. I., II.
——— Fourth Annual Report of the Bureau of Ethnology to the Secretary of the Smithsonian Institution, 1882-3.
——— United States Geological Surveys.—Monographs; vol. X., Dinocerta; vol. XI., Lake Lahontan.
——— Memoirs of the National Academy of Sciences; vol III., part 2.

Washington—Bulletins of the United States Geological Survey; Nos. 30 to 39, and index.
———— Mineral Resources of the United States, year 1885.
———— Annual Report of the Board of Regents of the Smithsonian Institution to July, 1885, part 1.
———— Sixth Annual Report of the United States Geological Survey, 1884-5.
———— Classified List of Publications of the Smithsonian Institution.
Würzburg— Sitzungsberichte der Physicalisch - Medicinischen Gesellschaft zu Würzburg, 1887.

LIST OF FELLOWS, MEMBERS, &c.

NOVEMBER, 1888.

Those marked (F) were present at the first meeting when the Society was founded. Those marked (L) are Life Fellows. Those marked with an asterisk have contributed papers.

			Date of Election.
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*Zietz, A.	Adelaide	1886

ASSOCIATES.

Hodgson. Mrs.	Port Victor	1884

APPENDIX.

FIELD NATURALISTS' SECTION

OF THE

Royal Society of South Australia

REPORT OF COMMITTEE FOR YEAR 1887–8.

THE Section has now completed the fifth year of its existence, and continues to make satisfactory progress.

Excursions.—During the year 12 excursions have been held, most of which have been well attended. The year witnessed a new departure in regard to excursions. Previously no excursion occupying more than one day had been made, but during the past year a visit of three days' duration has been paid to Murray Bridge, and a trip by sea to Kangaroo Island and neighbourhood extending over a week.

Evening Meetings.—Seven evening meetings have been held, at which the attendance has been fairly good, but not so large as the Committee would like to see. An improvement has, however, been noticed in the number of exhibits brought to these meetings. Papers have been contributed by the following gentlemen:—Professor Tate, F.G.S., Messrs. J. G. O. Tepper, F.L.S., W. L. Cleland, M.B., A. Molineux, R. H. Pulleine, E. Guest, A. F. Robin, and W. B. Poole.

Show of Native Plants.—The Committee have devoted considerable attention to the show of native plants, &c., to take place next month (October). It has been decided to form a section of the show to be open only to members of the Boys' Field Club. Satisfactory arrangements have been made to hold the show in the Town Hall at the same time as that of the Horticultural and Floricultural Society.

Native Poisonous and Fodder Plants.—An attempt was made during the year to raise funds for valuable prizes of collections of native poisonous and fodder plants; but so little response was made to the appeal by pastoralists and others thought to be specially interested in the matter that the scheme was abandoned.

Protection of our Native Fauna and Flora.—An effort is now being made by the Section with a view to the better protection of our native fauna and flora, a portion of the scheme being that Government Farm should be vested in trustees as a National Park, where the above object may to some extent be accomplished.

Membership.—There has been a gratifying accession to the membership during the year—21 new members having joined, of whom nine are ladies. From resignations and other causes 14 names have been struck off. The number now on the roll is 114.

Financial.—The amount received from subscriptions during the year is £20, while the expenses have been £23 7s. 1d. It should be mentioned, however, that this year the Section has, for the first time, had to pay for printing its "Proceedings," this expense having previously been borne by the Royal Society. The subscriptions in arrear amount to £4 10s.

J. G. O. Tepper, Chairman.
W. H. Selway, Jun., Hon. Sec.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

RECEIPTS AND EXPENDITURE FOR THE YEAR 1887-8.

DR. RECEIPTS.		CR. DISBURSEMENTS	
To Balance brought forward	£0 19 7	By Printing (General)	7 0 0
" Grant from Royal Society..	25 0 0	" " (Proceedings)	4 5 0
" Amount received from Subscriptions	20 0 0	" Advertising	3 1 0
		" Postages and Sundries	7 17 1
		" Attendance (Caretaker)	1 4 0
			23 7 1
		" Subscriptions handed over to Hon. Sec. Royal Soc.	20 0 0
		" Balance in hand	2 12 6
	£45 19 7		£45 19 7

Audited and found correct,

THOS. EVANS,
J. H. C. LANGDON, } Auditors.

Adelaide, 18th September, 1888.

W. H. SELWAY, Jun., Hon. Sec.

MICROSCOPICAL SECTION

OF THE

Royal Society of South Australia.

ANNUAL REPORT, 1887-8.

In presenting their annual report the Committee regret to state that the attendance at the monthly meetings is still small, as only a few of the members evince any real interest in microscopical research, most of them using their microscopes only as a means of amusement or relaxation in their spare hours. Still, great interest has been taken in the meetings by those who attended, and it is felt that much information has been derived from the mutual discussions on the various subjects introduced, particularly as many of the members are beginners in the use of the microscope. It is much to be regretted that the medical men of Adelaide do not more warmly support the Section, as in most cities they form the bulk of the members of the microscopical societies, and are the most able and earnest workers,

The Committee regret to have to report the loss of one of its energetic members (Mr. R. L. Mestayer, F.R.M.S.), who has removed to Sydney. There have been also several other resignations through removal to the other colonies during the year. Amongst them we would mention Mr. H. C. Mais, late Engineer-in-Chief, who, on leaving, presented to the Section a valuable collection of microscopical magazines, bound and unbound, which will form the nucleus of a library.

Mr. Mestayer also presented us with his Beck's Students' Microscope for use at the meetings.

The number of members at the present time is 38. The average attendance during the year, at the monthly meetings, has been nine.

The subjects discussed at the meetings were as follows :—

Oct. 11. Exhibition of objects, including those from excursion.
Nov. 8. Polariscope apparatus, by Mr. F. S. Crawford.
Mar. 13. Grinding and mounting Echinus spines, by Mr. J. Colbourne.

Apr. 10. Gossip meeting.
May 8. Conversazione.
June 12. Freshwater polyzoa, by Mr. W. B. Poole.
July 10. Development of the tadpole, by Mr. D. Fleming.
Aug. 14. Diffraction spectra, by Dr. Whittell, F.R.M.S.

The conversazione was not such a success as in the past. The attendance of members was small, and the display of instruments anything but creditable to the Section. The annual address was given by the chairman (F. S. Crawford, Esq.), and amongst the exhibits of interest was a set of apochromatic objectives by Zeiss, made of the new optical glass, which under the able manipulation of Dr. Whittell proved their superiority to the old class of objectives, by even the best makers.

The circulation of the microscopical magazines and mounted objects amongst the members is still maintained, and it is hoped that we shall soon be in possession of a number of bound volumes in the library, which can be lent for reading at home.

The balance-sheet (appended) shows receipts £32 6s. 6d., and expenditure £25 12s. 6d., leaving a balance in hand of £6 14s.

F. S. Crawford, Chairman.
J. W. Bussell, Hon. Secretary.

Receipts and Expenditure for year ending 30th September, 1888.

Receipts.	£	s.	d.
To Balance in hand 30th September, 1888— ..	0	1	6
" Members' Subscriptions	14	5	0
" Grant from Royal Society	18	0	0
	£32	6	6

Payments.	£	s.	d.
By Magazines	0	17	6
" Binding Magazines	1	8	0
" Post Cards and printing same	1	2	0
" Printing	1	17	6
" Advertising	2	4	3
" Postage	1	3	9
" Stationery	0	1	0
" Hire of Chairs for Conversazione	1	0	0
" Caretaker, attendance	1	12	0
" Royal Society, Subscriptions	14	6	6
	£25	12	6
Cash in hand	6	14	0
	£32	6	6

Examined and found correct.

F. S. CRAWFORD, Chairman.
J. W. BUSSELL, Hon. Secretary.

J. G. ASHTON, Auditor.
September 11th, 1888.

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TRANSACTIONS AND PROCEEDINGS

AND

REPORT

OF THE

ROYAL SOCIETY of SOUTH AUSTRALIA.

VOL. XII.

For 1888-89.

EDITED BY PROF. R. TATE, F.G.S., F.L.S.

[With Five Plates.]

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CONTENTS.

PAGE.

HOWCHIN, W. : The Foraminifera of the Older Tertiary of Australia—No I., Muddy Creek, Victoria (plate i.) 1

TEPPER, J. G. O. : Description of a New Genus and Species of Locustidæ 21

MACGILLIVRAY, P. H. : On some South Australian Polyzoa (plate ii.) 24

EAST, J. J. : On the Geological Structure and Physical Features of Central Australia (plate iii.) 31

MAIDEN, J. H. : Gums, and a Resin, produced by Australian Proteaceæ 54

CRAWFORD, FRAZER S. : Notes on Certain Pores on the Veins of some Diptera (plate iv.) 60

TATE, PROFESSOR R. : A Revision of the Flora of Kangaroo Island ... 62

TATE, PROFESSOR R. : A Census of the Indigenous Flowering Plants of Extra-Tropical South Austrlia (plate v.) 67

TATE, PROFESSOR R. : Definitions of Four New Species of Australian Plants 129

BLACKBURN, REV. T. : Further Notes on Australian Coleoptera, with Descriptions of New Species 132

MUELLER, BARON F. VON : Notes on the Geographical Distribution of Australian Characeæ 149

TEPPER, J. G. O. : Notes on Australian Fungi 150

Abstract of Proceedings 154

Annual Report 159

Donations to the Library 162

List of Fellows, Members, &c. 168

APPENDIX.

Annual Report of the Field Naturalists' Section... 171

Annual Report of the Microscopical Section 176

The Foraminifera of the Older Tertiary of Australia (No. 1, Muddy Creek, Victoria).

By Walter Howchin, F.G.S.

[Read October 4, 1888.]

Plate I.

The Older Tertiary beds exposed on Muddy Creek consist of two main divisions, sharply distinguished in their palæontological as well as their stratigraphical features.* In the following list those species which only occur in the Lower Bed are indicated by an asterisk (*). Those peculiar to the Upper Bed are marked with a dagger (†).

FAMILY MILIOLIDÆ.

Genus—Biloculina, *d'Orbigny.*

1. *B. ringens*, Lamk. Not common in Lower Bed, but include some very large examples. Upper Bed, rather scarce.

2. *B. depresa*, d'Orb. Most of the specimens possess flaps at the aboral extremity, as shown by Mr. Brady in "Challenger" Report, but those from Muddy Creek have these appendages much larger than the one figured by Mr. Brady. Lower Bed, rather scarce, as also in Upper Bed.

3. **B. irregularis*, d'Orb. These exhibit great diversity of form, some being much depressed laterally, whilst others in their subglobular outline approach very near to *B. sphaera*. The aperture is generally a curved gaping slit without tongue. Lower Bed, rather scarce.

4. *B. elongata*, d'Orb. Lower Bed and Upper Bed, rare.

5. †*B. bulloides*, d'Orb. The examples of this species are few in number, but of large size, and are distinguished by very large stelate apertures. Mr. Brady ("Challenger" Report) has shown that *B. sphaera*, d'Orb., sometimes possesses a labyrinthic aperture, especially in the case of deep water examples. In the present instance the aperture is not labyrinthic, but exhibits strong bars of shell substance radiating from the centre to the outer margin of the oral aperture. Upper Bed, rare.

6. †*B. sp.* A large species of *Biloculina*, possessing thick longitudinal costæ which are rendered still more conspicuous by a slight weathering of the test, was obtained from the Upper Bed;

* Dennant, Roy. Soc. S. Aust., vol. xi., p. 30, et seq.; Tate, Roy. Soc., N.S.W., 1888, p. 242.

but the specimens, which were few in number, have been unfortunately mislaid.

Genus—MILIOLINA, *Williamson.*

7. *M. seminulum*, Linn. Of the short and thick variety, mostly fine examples, measuring up to one-tenth of an inch. Lower Bed, moderately common. Upper Bed, very common.

8. **M. Cuvieriana*, d'Orb. Lower Bed, rather scarce.

9. *M. trigonula*, Lamk. In Lower and Upper Beds, rather scarce.

10. *M. tricarinata*, d'Orb. Lower Bed, rather scarce. Upper Bed, rare.

11. **M. valvularis*, Rss. A single example of robust build has, with some hesitation, been referred to this species. Lower Bed.

12. **M. prisca*, Terq. One of the pitted *Miliolæ*. In weathered specimens the pitted depressions become coarse perforations of the test. Lower Bed, moderately common.

13. *M. oblonga*, Montag. Not very characteristic, the specimens being mainly passage forms approaching the elongated varieties of *M. seminulum*. Lower Bed, moderately common. Upper Bed, common.

14. **M. pygmæa*, Rss. Lower Bed, moderately common.

15. *M. Linneana*, d'Orb. Several examples of this fine species were observed in both formations, but it is not very common.

16. **M. Brongniartii*, d'Orb. Lower Bed, rare.

17. **M. Ferussacii*, d'Orb. Lower Bed, moderately common.

18. **M. undosa*, Kar. Many of the specimens show intermediate characters approaching *M. Ferussacii*. Lower Bed, common. The most characteristic examples of this species in the Challenger collection were from Bass Straits.

19. **M. scrobiculata*, Brady. One or two specimens were obtained in Lower Bed which agree very closely with Mr. Brady's descriptions and figures. This form must be distinguished from *Articulina sulcata*, which it somewhat resembles.

20. *M. agglutinans*, d'Orb. Specimens vary from a broad oval outline to a much elongated test with produced neck. Lower Bed, very common. In Upper Bed the examples are fewer in number, and for the most part very coarse in test structure.

21. **M. angularis*, sp. nov. Pl. i., figs. 1—3.

Test free, elongate, fusiform; composed of numerous (about 18 or 20) chambers, arranged lengthways, and more or less spirally around the longer axis. Segments narrow and much compressed, investing, only the final whorl being visible externally. Early chambers oval in transverse section; the later chambers increase in size mainly in a lateral direction. The final whorl consists of from five to six chambers arranged at obtuse angles to each other,

and exhibit in peripheral outline as many facets and angles as there are segments in outer whorl. External surface smooth. Aperture small, terminal, obscure. Length, $\frac{1}{18}$ in.

The species now described is distinguished from its congeners by the great number of its chambers, their shallowness in comparison with their length, and the completeness of their investing character. Its nearest analogue in the Milioline series appears to be *M. alveoliniformis*, Br. The latter species can be easily distinguished by its arenaceous test, tubular chambers, and deeply depressed sutures, whilst *M. angularis* is always porcellaneous in its testaceous investment, the chambers are compressed transversely to little more than narrow slits, and the sutures are flush or marked by prominent angles in peripheral outline. Lower Bed, moderately common.

22. †*M. secans*, d'Orb. Upper Bed, rather scarce.
23. †*M. bicornis*, W. and J. Upper Bed, very rare.
24. †*M. insignis*, Brady. Upper Bed, very rare.

Genus—Spiroloculina, *d'Orbigny.*

25. **S. asperula*, Kar. Rather coarsely arenaceous, with a thin outspread test. In the Muddy Creek specimens none but the marginal segments are distinctly visible on the exterior. Lower Bed, rare.

26. *S. grata*, Terq. Lower Bed, rather scarce. Upper Bed, very rare.

27. **S. affixa*, Terq. Lower Bed, rather scarce.

28. †*S. limbata*, d'Orb. Upper Bed, rather scarce.

29. **S. Tateana*, sp. nov. Pl. i., figs. 4, 5.

Test oblong or nearly circular, much compressed ; primordial region biconvex and fusiform, consisting of numerous elongated segments arranged in an acervuline manner. Later chambers (varying from three to six on either side) flattened, outspread, and arranged concentrically. Segments narrow, smooth, nearly flush, much attenuated near the raised centre, increasing gradually in diameter towards the outer margin. Periphery rounded. Average size, $\frac{1}{40}$ in. diameter.

This shell is constructed on a double plan of growth, the earlier portions being Milioline, or investing, and the latter segments outspread or Spiroloculine. The acervuline chambers often exhibit a close resemblance to small examples of *Miliolina pygmæa*, and when the outspread portion of the test is reduced to a single segment on either side, as is the case with some specimens, the analogy is very close. The outer chambers form a fringe around the thickened centre very much like the alæ of certain seeds. It is a small and delicate shell, the outspread portion being sufficiently translucent to show by transmitted light

the septation with great distinctness. Mr. Brady, to whom specimens were submitted, informs me that he has occasionally met with examples similar to the present in recent material associated with *S. crenata*, Kar., and at the time regarded it as a weak thin-shelled modification of that species. *S. crenata* does not occur in the Muddy Creek material, but the form now described is comparatively common, and in no instance have I seen the slightest tendency to crenulation of the test as in *S. crenata*. There is therefore no alternative but to assign it a specific position. I have great pleasure in associating the name of my friend Prof. Ralph Tate, F.G.S., with this shell, as one who has devoted much time and conspicuous ability in working out the mollusca of the beds from which the species now described has been obtained. Lower Bed, moderately common.

Genus—Cornuspira, *Schultze*.

30. **C. involvens*, Rss. The larger examples exhibit an ornamentation of fine wavy disconnected striæ, running in a line with the convolutions. Lower Bed, rather scarce.

31. **C. foliacea*, Phil. It is worthy of note that all the specimens, which are more or less weathered, show a fine surface ornamentation resembling *C. striolata*, Brady ; but they undoubtedly belong to the above species, and the ornamentation seems to have been brought out as an effect of weathering. Lower Bed, rather scarce.

32. **C. crassisepta*, Brady. Lower Bed, rare.

Genus—Hauerina, *d'Orbigny*.

33. †*H. intermedia*, spec. nov. Pl. i., fig. 6.

Test free, compressed, consisting of two or three convolutions, which increase in size towards the oral extremity. Segments compressed laterally, arcuate, inflated, from six to ten visible externally and from three to five in final convolution ; segmentation marked externally by lines of sutural constrictions. Surface of test, smooth ; colour an opaque-white. Peripheral margin carinate, sub-carinate, or rounded. Aperture never compound, but Milioline in character, formed by a slight constriction of the chamber cavity, and furnished with a long straight tooth rising from the inferior portion of the peripheral margin of the final chamber, and extends to about half the diameter of the aperture in a line with the medial plane. Adult specimens, $\frac{1}{20}$ in.

The most striking feature of the form now described is the divergence which it exhibits from the generic type in relation to the aperture. *Hauerina*, as a rule, carries a very distinctive cribiform or compound orifice, whilst the present species is conspicuously and (so far as my observation has gone) invariably

Milioline in its oral features. This variation establishes another point of resemblance between *Hauerina* and *Miliolina*, in addition to that which is exhibited by the Milioline arrangement of its earlier segments. Upper Bed, moderately common.

Genus—VERTEBRALINA, *d'Orbigny.*

34. *V. insignis*, Brady. A feeble variety of this rare form occurs in the material, the triangular and carinate periphery, the ornamentation in regular parallel lines, and the absence of rectilineal growth are sufficient to mark the species. This is the first record of it in a fossil state, and it is only known as an existing species from three localities, one of which is Torres Straits. Lower and Upper Beds, rare.

Genus—ARTICULINA, *d'Orbigny.*

35. **A. sulcata*, Rss. Reuss figures a minute and somewhat dubious form under this name from the Tertiaries of Germany. It is known as a recent shell from four "Challenger" stations, one being off Raine Island, Torres Straits. Lower Bed, rare.

36. **A. sagra*, d'Orb. A complete example and the final segment of another were the only indications of this species observed. Lower Bed.

Genus—ORBITOLITES, *Lamarck.*

37. **O. complanata*, Lamk. Several fragments of fairly large shells were noted, but in each case these were broken and worn by attrition. They are most likely to be derived fossils not proper to the bed. Lower Bed.

Genus—PLANISPIRINA, *Sequenza.*

38. *P. sigmoidea*, Brady. This is one of the "Challenger" species, but only noted at five stations. Lower Bed, moderately common. Upper Bed, rare.

39. **P. exigua*, Brady. Two specimens occurred of this minute but interesting little shell. Like the preceding, this is the first record of its occurrence in the fossil condition. Lower Bed, rare.

FAMILY LITUOLIDÆ.

Genus—LITUOLA, *Lamarck.*

40. †*L. nautiloidea*, Lamk. A single example, showing labyrinthic structure, from Upper Bed.

Genus—PLACOPSILINA, *d'Orbigny.*

41. †*P. Cenomana*, d'Orb. Single specimen from Upper Bed.

Genus—Reophax, *de Montfort.*

42. **R. fusiformis*, Will. The examples of *Reophax* from Muddy Creek are remarkable for the very coarse structure of their tests, being built up of the exuviæ of *M. pygmæa*, *Discorbinæ*, and other foraminiferal shells, and shelly sand. A few single-chambered specimens have been referred to this species, but they are not common. Lower Bed.

43. **R. scorpiurus*, Montfort. One or two tapering and segmented examples may be referred to this species, but it is rarer than the preceding. Lower Bed.

Genus—Haplophragmium, *Reuss.*

44. **H. pseudospirale*, Will. Several relatively large examples, coarsely built, compressed, obscurely segmented, one with subspiral commencement. Lower Bed, rather scarce.

45. **H. agglutinans*, d'Orb. A single specimen has been referred to this species, although it is far from characteristic, being subglobular and without rectilinear segments, but this seems the best classification that can be made at present. Lower Bed.

46. **H. sphæroidiniformis*, Br. *MS.* Mr. Brady has favoured me with the following notes on this, at present, undescribed species:—"I have this in my cabinet (from Mr. Robertson, I think). I believe it to be the Sphæroidine isomorph in the *Haplophragmium* series, just as *H. globigeriniformis* is the Globigerine form of the genus. I have given it the *MSS.* name of *Haplophragmium sphæroidiniformis.* The aperture resembles *Sphæroidina* more than *Textularia*, and some specimens which I have seen are very like *Sphæroidina*—indeed, in all but texture." Lower Bed, common.

Genus—Bdelloidina, *Carter.*

47 **D. aggregata*, Carter. Three examples of this very rare species were met with. Mr. Brady ("Challenger" Report) states that the known distribution of the species was limited to the north coast of New Guinea for recent specimens, and a single Cretaceous specimen in the fossil condition. The forms from Muddy Creek are detached, and show clearly on the underside the peculiar labyrinthic structure of the test. Lower Bed, rare.

Genus—Textularia, *Defrance.*

48. **T. aspera*, Brady. Very fine examples, and in considerable numbers. Lower Bed.

49. **T. gibbosa*, d'Orb. Moderately common, Lower Bed.

50. **T. agglutinans*, d'Orb. Typical specimens of this species are rare in the material, and at best can only be reckoned as passage forms with allied species. Lower Bed.

51. *T. agglutinans*, var. *porrecta*, Brady. Differs from the type

mainly by the chambers being less inflated, the septal lines more nearly flush, the shell elongated, and has a neater and more symmetrical form than *T. agglutinans*. It is in the main a coral-reef form in the recent condition. Lower and Upper Beds, rather scarce.

52. **T. rugosa*, Rss. This is also a characteristic coral-reef species. Lower Bed, rare.

53. *T. sagittula*, Def. One of the commonest forms in this very rich material, many of the specimens attaining a large size. Lower and Upper Beds.

54. **T. sagittula* var. *fistulosa*, Br. A few examples of this variety with fistulose growths on the lateral edges occur, but they are relatively rare. Lower Bed.

55 **T. carinata*, d'Orb. This is a somewhat variable species. A single specimen was noted, which I think must be referred to it, although the septal lines are non-limbate and slightly depressed. The lateral margins are sharply carinate, and give indications of having possessed dentate appendages, although most of these are broken, probably from attrition. Lower Bed.

56. **T. gramen*, d'Orb. A species of the *T. sagittula* type, but much broader in relation to its length, and with greater inflation of the later segments. Lower Bed, rather scarce.

Genus—Pavonina, *d'Orbigny*.

57. **P. flabelliformis*, d'Orb. The only species of the genus founded by d'Orbigny as far back as 1826, and unverified by subsequent researches until recent years. Mr. Brady records it from nine or ten localities, one of which is Torres Straits. It is a compressed, fan-shaped, dimorphous foraminifer ; textularian in its earlier segments, the later segments being arranged in single series. This is the first record of its occurrence in a fossil condition. Lower Bed, very rare.

Genus—Verneuilina, *d'Orbigny*.

58. *V. triquetra*, Münst. The specimens show a considerable range as to size and contour, but are always distinctly triangular in shape, with rough exterior. Lower Bed, common. Upper Bed, rare.

59. **V. tricarinata*, d'Orb. More regular in shape than the preceding, and less rugose. Lower Bed, rare.

60. **V. polystropha*. Lower Bed, rare.

61. **V.* sp. A form closely allied to *V. spinulosa*, Reuss, from which it differs chiefly in its more elongated contour, absence of spines, and nearly flush septation. Specimens were submitted to Mr. Brady, who writes that he is "convinced it has been figured,'

although at the time he could not find the description. Lower Bed, rather scarce.

62 †*V. pygmaea*, Egger. Upper Bed, very rare.

Genus—GAUDRYINA, *d'Orbigny.*

63. **G. rugosa*, d'Orb. Closely resembles *V. triquetra*, from which it differs only in the biserial arrangement of its later chambers. Lower Bed, rather scarce.

Genus—CLAVULINA, *d'Orbigny.*

64. *C. communis*, d'Orb. Lower and Upper Beds, very rare.

65. *C. angularis*, d'Orb. Lower and Upper Beds, very rare.

Genus—BULIMINA, *d'Orbigny.*

66. *B. elegantissima*, d'Orb. A single example was obtained of this beautiful little shell from each of the beds of the Muddy Creek section.

67. **B. obtusa*, d'Orb. A sub-cylindrical variety with obtuse aboral extremity. Occurs as a Cretaceous form in European strata. Lower Bed, very rare.

Genus—BOLIVINA, *d'Orbigny.*

68. **B. punctata*, d'Orb. Lower Bed, rather scarce.

69. **B. limbata*, Br. In the recent condition this is a common form on the New Guinea coasts and the Australian coral-reef. Lower Bed, rare.

70. **B. dilatata*, Rss. Two specimens, which are not altogether characteristic, have been assigned to this species. They are apparently intermediate forms uniting *B. dilatata* with *B. pygmaea*, Br. Lower Bed.

Genus—CASSIDULINA, *d'Orbigny.*

71. *C. subglobosa*, Br. In the recent condition it has a deep water habitat. Common in Lower Bed, but of small size. Upper Bed, very rare.

72. **C. lævigata*, d'Orb. Lower Bed, rare.

Genus—EHRENBERGINA, *Reuss.*

73. **E. serrata*, Rss. Lower Bed, rather scarce.

FAMILY LAGENIDÆ.

Genus—LAGENA, *Walker & Jacob.*

74. **L. hexagona*, Will. A single specimen. Lower Bed.

75. *L. sulcata*, W. & J. Lower Bed, rare. Upper Bed, very rare.

76. **L. globosa*, Montag. Lower Bed, rare.

77. **L. lineata*, Will. A single specimen. Lower Bed.
78. **L. marginata*, W. & B. Lower Bed, rare.
79. †*L. melo*, d'Orb. Upper Bed, very rare.

Genus—Nodosaria, *Lamarck.*

The representatives of this genus in the material, although not common as to individuals, represent a relatively large number of species, and include some specimens of unusual size. In classification I have followed Mr. Brady's method of including the Dentaline and Glanduline varieties under the present heading.

80. **N. soluta*, Rss. Fine typical specimens. Lower Bed, rare.
81. *N. pauperata*, d'Orb. One example (faintly striated) is one-sixth of an inch in length. Lower and Upper Beds, rare.
82. **N. scalaris*, Batsch. The specimens are mostly limited to two or three chambers. Lower Bed, rather scarce.
83. **N. multilineata*, Borne. A few fine examples occur. Lower Bed.
84. **N. obliqua*, Linné. Lower Bed, rare.
85. **N. plebeia*, Rss. A single specimen. Lower Bed.
86. **N. costulata*, Rss. A single example, consisting of three inflated chambers, apiculate, and with strongly developed costæ bridging the sutural depressions. Lower Bed.
87. **N. affinis*, d'Orb. One large example of this species measures five-sixteenths of an inch in length. It consists of seven segments, with a constriction near the middle of the test, which gives it the appearance of being nearly nipped in two. Lower Bed, rare.
88. *N. raphanus*, Linné. Not common. One example measures a quarter of an inch in length. Lower and Upper Beds.
89. †*N. consobrina*, d'Orb. Upper Bed, very rare.
90. †*N. (G.) æqualis*, Rss. Upper Bed, rare.
91. *N. (G.) lævigata*, d'Orb. Lower Bed, rare. Upper Bed, very rare.

Genus—Lingulina, *d'Orbigny.*

92. **L. carinata*, var. *seminuda*, Batsch. A single very fine example, consisting apparently of only two segments. Lower Bed.

Genus—Marginulina, *d'Orbigny.*

93. **M. costata*, Batsch. Lower Bed, rather scarce.

Genus—Frondicularia, *Defrance.*

94. *F. complanata*, Def. Lower Bed, rare. Upper Bed, very rare.

Genus—Vaginulina, *d'Orbigny.*

95. **V. linearis*, Montag. Lower Bed, very rare.

Genus—Rhabdogonium, *Reuss.*

96. †*R. sp.* Two shells, one a remarkably fine example of a *Rhabdogonium* with symmetrical outline and strongly developed tricarinate test, were obtained from the Upper Bed. I have little doubt that they represent an undescribed species, but the specimens have been unfortunately mislaid, and therefore cannot be determined at present.

Genus—Cristellaria, *Lamarck.*

97. **C. rotulata*, Lamk. Lower Bed, rare.

98. **C. cultrata*, Mont. Lower Bed, rare.

99. **C. articulata*, Rss. Lower Bed, rather scarce.

100. **C. convergens*, Borne. Lower Bed, very rare.

101. **C. tricarinella*, Rss. Lower Bed, rare. Recent specimens have been obtained from three localities, all in the Western Pacific.

Genus—Polymorphina, *d'Orbigny.*

102. **P. regina*, Br. P. & J. A few rather fine examples. Lower Bed.

103. *P. elegantissima*, P. & J. This fine species is most at home in recent waters on the eastern shores of Australia from Torres Straits to Bass Straits. In the Muddy Creek beds it is a common form, but very variable in contour. Specimens can be found in every intermediate stage, from a nearly circular outline in one direction to sub-cylindrical in elongated varieties. Lower and Upper Beds, common.

104. *P. oblonga*, d'Orb. Lower Bed, very rare. Upper Bed, rather scarce.

105. *P. gibba*, d'Orb. Lower Bed, a moderately common form, including some fistulose examples. Upper Bed, rather scarce.

106. *P. lactea*, W. &. J. Rare in both Lower and Upper Beds.

107. **P. lactea*, var. *oblonga*, Will. Lower Bed, very rare.

108. *P. communis*, d'Orb. Rather scarce in both Lower and Upper Beds.

109. **P. ovata*, d'Orb. Lower Bed, rare.

110. **P. dispar*, Stache. A strong, compressed, inequilateral and twisted shell, determined by Prof. Stache from examples obtained from the New Zealand Tertiaries. Lower Bed, moderately common.

111. †*P. rotundata*, Born. Upper Bed, rare.

112. †*P. compressa*, d'Orb. Upper Bed, moderately common.

Genus—Uvigerina, *d'Orbigny.*

113. **U. Canariensis*, d'Orb Lower Bed, rather scarce.

114. † *U. pygmaea*, d'Orb. Upper Bed, very rare.

Genus—SAGRINA, *d'Orbigny.*

115. **S. limbata*, Br. Pl. i., fig. 7. A single specimen of this very rare form was obtained from the Lower Bed. The test is longer and more slender than Mr. Brady's figure, and is also more curved in outline, but in all essential features agrees perfectly with the type. The specimens on which the species was determined by Mr. Brady came from Torres Straits, and this is only one of the many illustrations of the identity of forms between the last-named locality and the Lower Tertiaries of Southern Australia.

FAMILY GLOBIGERINIDÆ.

Genus—GLOBIGERINA, *d'Orbigny.*

116. *G. bulloides*, d'Orb. Lower Bed, very common. Upper Bed, rare.

117. **G. bulloides* var. *triloba*, Rss. Lower Bed, rather scarce.

118. **G. inflata*, d'Orb. Lower Bed, rather scarce.

119. **G. helicina*, d'Orb. Lower Bed, rare.

Genus—ORBULINA, *d'Orbigny.*

120. *O. universa*, d'Orb. Lower Bed, very common, frequently large. Upper Bed, rather scarce.

Genus—SPHÆROIDINA, *d'Orbigny.*

121. **S. bulloides*, d'Orb. Lower Bed, examples small but moderately common.

FAMILY ROTALIDÆ.

Genus—SPIRILLINA, *Ehrenberg.*

122. **S. decorata*, Br. Differs from the recent form in possessing a rounded edge instead of being carinate, and in the absence of transverse furrows. Lower Bed, rare.

123. *S. tuberculata*, Br. Mr. Brady's figures show the convolutions as visible on the exterior surface, wholly or in part, but the Tertiary examples have a greater tubercular growth which completely hides the septal lines, and often renders the shell slightly biconvex. Lower Bed, rather scarce. Upper Bed, very rare.

124. **S. limbata*, Br. Lower Bed. Specimens small and somewhat rare.

125. **S. inæqualis*, Br. The convolutions of the superior face are strongly marked by raised, limbate ridges, with the depressed areas coarsely pitted. The inferior side of the shell is of greater extent than the superior, perfectly flat, shows no septal lines exteriorly, and is uniformly covered with tubercles. Lower Bed, rather scarce.

Genus—Discorbina, *Parker & Jones.*

The Discorbinæ of the Lower Bed are represented by a considerable number of species, but as individuals are almost without exception small and starved examples and in limited numbers. In the Upper Bed they are finer examples, and more numerous, and include several species not found in the Lower Bed.

126. *D. turbo*, d'Orb. Lower Bed, rather scarce; Upper Bed, very common.

127. *D. rosacea*, d'Orb. Rather scarce in both Beds.

128. *D. globularis*, d'Orb. Lower Bed, rather scarce; Upper Bed, rare.

129. **D. Araucana*, d'Orb. Lower Bed, rare.

130. **D. Bertheloti*, d'Orb. Lower Bed, rare.

131. *D. biconcava*, P. & J. Much compressed bilaterally. Lower Bed, rare; Upper Bed, rather scarce.

132. **D. patelliformis*, Br. Lower Bed, rather scarce.

133. **D. orbicularis*, Terq. Lower Bed, rare.

134. **D. (?) tabernacularis*, Br. If this be rightly assigned, it is a feeble example destitute of limbation, although resembling the species in other respects. Lower Bed, rare.

135. *D. polystomelloides*, P. and J. Lower Bed, a single example of this fine species. Upper Bed, rather scarce.

136. †*D. pileolus*, d'Orb. Upper Bed, rather scarce.

137. †*D. vesicularis*, Lamk. Upper Bed, rare.

128. †*D. Vilardeboana*, d'Orb. Upper Bed, moderately common.

139. †*D. opercularis*, d'Orb. Upper bed, rare.

140. †*D. rarescens*, Brady. Upper Bed, rare.

141. **D. cruciformis*, sp. nov. Pl. i., figs. 13, 14.

Test subglobular, slightly compressed laterally, consisting of about three convolutions arranged inequilaterally on a Rotaliform plan, so that usually four segments are visible on the inferior and about eight on the superior face. Segments inflated, thelr convex surfaces on the superior face studded with short thickly-set spines; sutural lines depressed, excavated, and free from spines. Inferior surface smooth, its four segments arranged in form of a Maltese cross. Umbilicus depressed. Aperture a small circular orifice situated in the umbilical depression. Average size, $\frac{1}{45}$ in.

This peculiar little shell is obese, but unequally convex. Its superior surface is rendered rugose by the presence of short spines so thickly set that they cannot be distinguished as spinous growths except by viewing them laterally where they terminate in an abrupt line. Its nearest analogue is perhaps *Discorbina pulvinata*, a new species obtained by Mr. Brady from two localities in Challenger material, viz., Admiralty Islands and Torres Straits. The species now described can be easily distinguished from the one referred to by its greater number of chambers, the

absence of ornamentation from its inferior surface, and the cruciform aspect which the final whorl of chambers assumes. Lower Bed, moderately common.

Genus—Planorbulina, *d'Orbigny.*

142. **P. mediterranensis*, d'Orb. Lower Bed, rare.

143. **P. acervalis*, Br. Lower Bed, a single example, but characteristic.

144. **P. larvata*, P. and J. A very symmetrical discoid test, often developing on superior surface tubercular growth of shell substance. In the recent condition it is an exclusively tropical species. The specimens from Muddy Creek are rarely tuberculated, but exhibit a smooth flat test with regularly imbricated margin. Lower Bed, moderately common.

Genus—Truncatulina, *d'Orbigny.*

145. **T. lobatula*, W. and J. Lower Bed, rather scarce.

146. **T. variabilis*, d'Orb. Several irregular-growing examples have been referred to this species. Lower Bed, rare.

147. *T. reticulata*, Czjzek, Lower Bed, moderately common. Upper Bed, rare.

148. **T. echinata*, Br. A globose shell with large circular aperture, the surface of test more or less studded with short blunt spines irregularly distributed. In the recent condition it is mostly a coral-reef species. Lower Bed, rather scarce.

149. *T. echinata*, var. *lævigata*, var. nov. Pl. i., fig. 8.

Closely resembles the typical form in general features, but is devoid of all spinous appendages, the exterior surface of test being perfectly smooth. The aperture is also less conspicuous than in *T. echinata*, and has no bordered rim as in that form. It is more common than the type in the Muddy Creek material, and as such seems to require at least a varietal distinction. Lower Bed, moderately common. Upper Bed, rare.

150. *T. Ungeriana*, d'Orb. Lower Bed, common. Upper Bed, rather scarce.

151. *T. Haidingerii*, d'Orb. Lower Bed, rather scarce. Upper Bed, rare.

Genus—Anomalina, *d'Orbigny.*

152. **A. rotula*, d'Orbigny. Lower Bed, rare.

153. *A. ammonoides*, Rss. Lower Bed, moderately common. Upper Bed, rare.

154. **A. polymorpha*, Costa. Three examples, two of which are spinous. Lower Bed.

Genus—Carpenteria, *Gray.*

155. **C. proteiformis*, Goës. Very fine examples up to two-fifths

of an inch in length. Large specimens sometimes branched, and contain over twenty chambers. This is the first record of this interesting species in a fossil condition. The nearest point of distribution in the recent state, so far as known, is Torres Strait, but the recent specimens do not appear to be so fine as those from Muddy Creek. Lower Bed, moderately common.

Genus—Polytrema, *Risso.*

156. *P. miniaceum*, var. *alba*, Carter. Small specimens, and destitute of colour. Whether the absence of colour be original or due to age and fossilization it is difficult to say. I have, however, classed them with the variety with which, in their present appearance, they perfectly agree. Lower Bed, moderately common. Upper Bed, very rare.

Genus—Gypsina, *Carter.*

157. *G. globulus*, Rss. The spherical form of *Gypsina* differs widely as to the size of individuals, and is not uncommon in Lower Bed. Upper Bed, rather scarce.

158. *G. vesicularis*, P. & J. Examples of the typical hemispherical form are rare, these being replaced by individuals of a discoid shape, with thick rounded periphery, which are common in the Lower, and rather scarce in Upper Bed.

159. **G. inhærens*, Schultze. Lower Bed, rare. The "Challenger" collections of this species were limited to two localities, Bass Straits and south of New Guinea.

Genus—Pulvinulina, *Parker* and *Jones.*

160. *P. repanda*, Fichtel and Moll. The typical form, passing into and including the next in this list, are amongst the commonest forms in the Lower Bed material. Upper Bed, rather scarce.

161. **P. pulchella*, d'Orb. A very neat little shell, with limbate sutures. Lower Bed, common.

162. **P. Schreibersii*, d'Orb. The septation on the superior side of the test is obscure, but in other respects the examples agree with the above. Lower Bed, rather scarce.

163. **P. Berthelotiana*, d'Orb. A few specimens of a small, convex, many chambered, limbate shell, appear to belong to this species. Lower Bed.

164. **P. Partschiana*, d'Orb. Lower Bed, rather scarce.

165. **P. Patagonica*, d'Orb. Lower Bed, rare.

166. **P. Hauerii*, d'Orb. Lower Bed, rare.

167. **P. auricula*, Fichtel and Moll. Lower Bed, rare.

168. **P. oblonga*, Will. Lower Bed, rare.

169. **P. semiornata*, sp. nov. Pl. i., figs. 12*a*—*c*. Test subglobular, more or less compressed on superior face; periphery, obtuse

or rounded ; convolutions few in number (generally three). Segments few (three or four in final convolution), and much inflated. Superior surface, ornamented by raised papillæ, or by thick exogenous shell-growth, with deep excavations at intervals, giving a roughly reticulate appearance to the test. Inferior surface highly convex, without ornamentation, and smooth. Sutures non-limbate, marked externally by depressed lines. Umbilicus slightly excavated, and usually possesses several large perforations. Aperture, an inconspicuous slit (sometimes spanned by shelly growths), situated on the umbilical margin of final segment. Large specimens measure $\frac{1}{16}$ inch.

A large shell, combining in some degree the external features of *Rotalia papillosa*, Br., and *Pulvinulina punctulata*, d'Orb. It can be easily distinguished by its nearly plano-convex outline, inflated chambers, and fewness of its segments. Its size renders it conspicuous in the material, but it is not very common. Lower Bed.

Genus—ROTALIA, *Lamarck.*

170 *R. clathrata*, Br. One of the new species of the "Challenger" collection. The home of this very striking form appears to be between Bass Straits and Cooks Straits, New Zealand, where it was taken at four stations, with a bathymetrical range of 275 fathoms. The only other note of its occurrence is at two stations on the west coast of Patagonia, but the specimens from the latter locality were small and not so characteristic. At Muddy Creek it is moderately common in Lower Bed and very common in Upper Bed.

171. **R. papillosa*, Br. With a single exception this is only known as a South Pacific species. The Challenger Report records it from eight stations, the majority of which occur in the neighbourhood of New Guinea and northern and eastern coasts of Australia. It is a rare form in the Lower Bed material, and the examples are not quite so globose in outline as the type.

172. **R. papillosa* var. *compressiuscula*, Br. A few not very characteristic examples occur. They are really passage forms between the present variety and *R. clathrata*. In the recent state it is usually associated with the type in distribution. Lower Bed, rare.

173. **R. calcar*, d'Orb. Lower Bed, rare.

Genus—CALCARINA, *d'Orbigny.*

174. †*C. rarispina*, d'Orb. The examples usually exhibit from three to six spines. Upper Bed, moderately common.

FAMILY NUMMULINIDÆ.

Genus—Nonionina, *d'Orbigny.*

175. **N. umbilicatula*, Montagu. Lower Bed, rather scarce.

176. *N. depressula*, W. & J. Rare in both Lower and Upper Beds.

177. **N. stelligera*, d'Orb. Lower Bed, rather scarce.

Genus—Polystomella, *Lamarck.*

178. *P. macella*, F. & M. A very common form in the Lower Bed material, including some fine examples. It seems to take the place of the more widely diffused *P. crispa*. Upper Bed, rather scarce.

179. *P. craticulata*, F. & M. Occurs as a recent form on the Australian Coral Reef. Rare in both Lower and Upper Beds.

180. **P. verriculata*, Br. Only known in the recent state from two localities off East Moncœur Island (Bass Straits) and Curtis Straits, Queensland. Lower Bed, rare.

181. †*P. imperatrix*, Br. The examples, although fine and striking, are not, as a rule, very characteristic. One example was noticed with well-developed spines. The test is invariably subangular, but rarely spinous. It is probably a varietal or intermediate form which cannot be more accurately classed. Upper Bed, common.

Genus—Amphistegina, *d'Orbigny.*

182. *A. Lessonii*, d'Orb. Mostly of the compressed variety. Lower Bed, moderately common. Upper Bed, rather scarce.

Genus—Operculina, *d'Orbigny.*

183. **O. complanata*, Def. Specimens large and very common in Lower Bed.

184. **O. complanata*, var. *granulosa*, Leymerie. Examples with more or less of surface ornamentation are also common. Lower Bed.

Genus—Nummulites, *Lamarck.*

185. *N. variolaria*, Sowerby. This is the most common and striking of the foraminiferal forms in the Muddy Creek Lower Bed. Its occurrence in company with several other large and striking species gives the Lower Tertiary of Australia a foraminiferal facies very closely resembling beds of a similar age in the Northern Hemisphere. It occurs sparingly, along with examples of *Operculina*, in the Upper Bed, but it is very probable that both these forms in the Upper Bed have been derived from the older formation.

Genus—ORBITOIDES, *d'Orbigny*.

186. **O. Mantelli*, Morton (sp.). Mostly small specimens, common in the Lower Bed. One example is much larger than the average size, and is $\frac{9}{20}$ in. in diameter. A few subglobular examples, surrounded with fringe of delicate translucent chamberlets, might perhaps be referred to *O. dispansus*, Sow.

187. **O. stellata*, sp. nov. Pl. i., figs. 9—11. Test free, compressed, lenticular; peripheral margin attenuate, angular in outline, or produced at more or less regular intervals into flat spinous projections. Surface of test rough and vesicular, destitute of areolæ, but in well preserved specimens exhibits externally a few tubercles of clear shell substance. Primordial region occupied by one or more chambers of large size; chamberlets of medial disc, numerous, cylindrical, or roughly hexagonal in section, arranged in concentric annuli; investing chamberlets compressed laterally, arranged in successive layers on either side of the medial plane; septal partitions thin, except where columns of clear shell substance pass radially from the primordial region to the external surface of test. Spinous projections formed by intermittent extensions of chamberlets at the peripheral margin. Average size, $\frac{1}{8}$ inch.

This is an interesting modification of the genus in the direction of *Tinoporus*, but whilst simulating the latter in external appearances, it is destitute of the supplemental skeleton characteristic of that genus; and is clearly differentiated from both *Tinoporus* and *Gypsina* by possessing the duplex arrangement of segments, which marks-off *Orbitoides* so clearly from these genera. The periphery is sometimes produced into a thin carina composed of a single layer of chamberlets, which from their regularity of shape and disposition can be determined as extensions of the medial disc. The spinous projections, whilst seldom entirely absent, vary considerably in their number and arrangement. Specimens occur having the outline of an inequilateral triangle, and pass through every degree of variation in angular outline to that of a symmetrical arrangement of radiating spines, as in fig. 9, pl. i.; the thickness of the walls separating the chamberlets is relatively much less in comparison with the chamber cavities than is commonly the case in this genus, as shown in pl. i., fig. 10*b*. The primordial region, when examined in flat sections, is seen to consist of several large inflated and spirally arranged segments, which are not visible in the transverse section shown in fig. 10*a*. Figs. 11*a*—11*b* represent a large and very abnormal specimen assumed to belong to this species, having two medial planes growing at right angles to each other, so as to give a triangular or prismatic form to the text when seen in transverse section. Lower Bed, common.

General Remarks.

With regard to the Foraminifera, the Muddy Creek Beds contain one of the richest local fauna that is known, either recent or fossil. The rich gatherings from the Suffolk Crag (Pliocene) yielded 100 species, and the greatest number of species from any one locality in the British area in this formation was 62 species. The Lower Bed at Muddy Creek has yielded 163 species, and the Upper Bed 76 species. Of these 52 species are common to both formations, leaving a net total of 180 species and seven varieties for the section as a whole. Mr. Brady ("Challenger" Report) makes special mention of a remarkably rich dredging off Raine Island, Torres Straits, which contained a greater number of species in this class than any other haul made during the cruise, and included many rarities. There is a close resemblance in the number of species obtained from Torres Straits and Muddy Creek, whilst many of the rarer forms are common to both.

The stratigraphical distinction between the two beds of the section concerned is sufficiently marked from the fact that the Foraminifera common to both only amount to 28 per cent. of the whole. There is also a marked change in the general facies of the rhizopodal fauna as we pass from the lower to the upper geological horizon, pointing to a shallowing of the sea bottom, which is indicated not only by the relatively larger numbers of shallow-water species in the Upper Bed, but these are proportionately more numerous and better developed as individuals.

With regard to climatic conditions, the majority of the Muddy Creek Foraminifera point to a higher temperature prevailing in the locality of their deposition than is proper to such latitudes in the present day. A very large proportion of species are characteristically tropical, and a decided majority in each case have their geographical range, in the present, restricted to the tropical and warmer temperate zones. So far as can be determined, the following summary will illustrate the bathymetrical and climatic distribution of the species concerned :—

Bathymetrical Range.

Lower Bed—68 (49 per cent.) shallow; 39 (28 per cent.) moderately deep to deep; 32 (23 per cent.) unrestricted.

Upper Bed—42 (58 per cent.) shallow; 12 (16 per cent.) moderately deep to deep; 18 (25 per cent.) unrestricted.

Climatal Range.

Lower Bed—37 (26 per cent.) tropical ; 47 (33 per cent.) warm temperate and tropical; 9 (6 per cent.) temperate; 48 (34 per cent.) cosmopolitan.

Upper Bed—13 (18 per cent.) tropical; 25 (35 per cent.) warm temperate and tropical; 2 (3 per cent.) temperate; 31 (43 per cent.) cosmopolitan.

In their geological range; the Lower Bed contains six species which date from Palæozoic times, five Trias, eight Lias, four Jurassic, 18 Cretaceous, 68 Tertiary, five Quaternary, whilst 37 have not been previously noted in a fossil condition, and three others only in Australian geology.

In the Upper Bed two have a Palæozoic record, three Trias, five Lias, three Jurassic, eight Cretaceous, 27 Tertiary, and 14 not previously observed as fossil forms.

The occurrence of *Nummulites variolaria* in very great numbers in the Lower Bed is of special interest as showing uniformity of palæontological features between the Older Tertiaries of Australia and rocks of a like age in Europe. The resemblance in this respect is still further shown by the occurrence of large examples of *Operculina* and other types which are commonly found associated with *Nummulites* in the Eocene Beds of the Northern Hemisphere, and which are also conspicuous species from Muddy Creek.

In the material gathered by the "Challenger" expedition, the Australasian region supplied a high proportion of the new species obtained in this department of marine zoology. It was therefore to be expected that the later geological formations of Australia would show more or less resemblance to the dredgings in the adjacent waters, and give geological examples of some of the new species found in a recent condition. Including the new forms described in this paper, 50 species occur in the list which are now recognised for the first time as fossils. The general resemblance, which the Muddy Creek Foraminifera bear to the recent species now inhabiting the northern and north-eastern shores of tropical Australia, is very striking, and would appear to indicate that in early Tertiary times either the tropical currents of the ocean bore more directly on the southern shores of the continent, or that the zone of tropical heat reached nearer to the Pole in the Southern Hemisphere, as it appears to have done in the Northern, at the beginning of the Tertiary period.

DESCRIPTION OF PLATE I.

Figs. 1—3. *Miliolina angularis*, sp. nov.

Fig. 1. Longitudinal aspect. Exterior of test broken on one facet exhibiting the shallowness of chamber cavity. x 17 diam. Fig. 2. Transparent longitudinal section. x 22 diam. Fig. 3. Transparent transverse section, made near the centre of test, exhibiting the spiralline arrangement of chambers and angular contour of shell. x 40 diam.

Figs. 4—5. *Spiroloculina Tateana*, sp. nov.

Fig. 4*a*. Lateral view of an oval specimen, x 33 diam. Fig. 4*b*. Peripheral aspect of ditto. Fig. 5. Lateral aspect of circular example. x 30 diam.

Figs. 6*a*—6*b*. *Hauerina intermedia*, sp. nov.

Fig. 6*a*. Lateral view of average specimen. x 20 diam. Fig. 6*b*. Peripheral aspect of same object.

Fig. 7. *Sagrina limbata*, Br. x 30 diam.

Fig. 8. *Truncatulina echinata* var. *lævigata*, var. nov. x 40 diam.

Figs. 9.—10*b*. *Orbitoides stellata*, sp. nov.

Fig. 9. Lateral aspect of regularly stellate example. x 13 diam. Fig. 10*a*. Transparent section through centre of test at right angles to medial plane. x 17 diam. Fig. 10*b*. Small portion of same section more highly magnified showing column of clear shell substance and the relative thinness of chamber walls. x 75 diam.

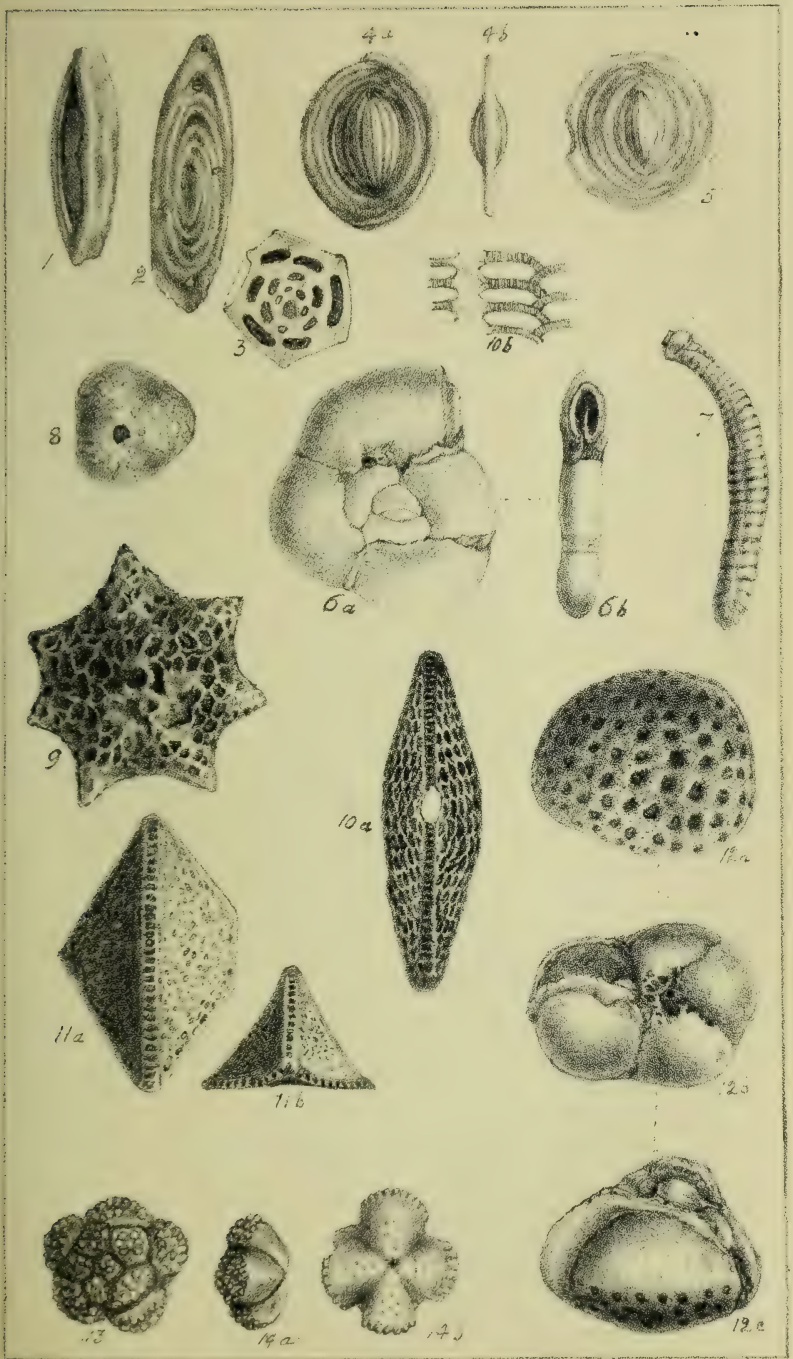
Figs. 11*a*—11*b*. Probably an abnormal example of *Orbitoides stellata*, possessing two medial planes growing at right angles to each other. x 12 diam.

Figs. 12*a*—12*c*. *Pulvinulina semiornata*, sp. nov.

Fig. 12a. Superior aspect showing rugose shell growth. x 30 diam. Fig. 12*b*. Inferior aspect of same object entirely destitute of ornamentation. x 25 diam. Fig. 12*c*. Peripheral view. x 25 diam. The final segment in this example is broken and a specimen of *Lagena sulcata* has become fixed in aperture of test, as shown by figs. 12*b* and *c*.

Figs. 13—14*b*. *Discorbina cruciformis*, sp. nov.

Fig. 13. Superior aspect of test. x 40 diam. Fig. 14*a*. Peripheral view of another example. x 40 diam. Fig. 14*b*. Inferior aspect of ditto.


1
2
3
4a
4b
5
6a
6b
7
8
9
10a
10b
11a
11b
12a
12b
12c
13
14a
14b

Description of a New Genus and Species of Locustidæ.

By J. G. O. Tepfer, F.L.S.

[Read June 7, 1889.]

Hectoria, *gen. nov.*

Male (imago and nymph).—Body stout, short, somewhat compressed laterally.

Head rather small; vertex raised, somewhat globose above, and forming a short ridge between the antennæ, with abrupt sides, a fine furrow lengthwise, and separated by transverse furrows at either end.

Eyes rather small, very prominent, ocelli not apparent.

Palpi long, slender, joints cylindrical, last joint slightly thickened towards extremity; tips rounded.

Antennæ extremely slender, setaceous, fully twice the length of the body or more, finely ciliated towards the tips; base below and inwards surrounded by a narrow ridge; joints cylindrical, very numerous; first joint very stout, a little longer than thick; second somewhat shorter and half as thick; third again diminished in the same proportion; the remainder nearly of the same length and gradually tapering to the end.

Thorax stout, narrow; sides straight, flat. Prothorax with a steep saddle-like depression near the front, continued along the side in the form of two or three shallow closely adjoining furrows; anterior part raised, hood-like, triangular, hollow in front, and terminating in an acute point; posterior pronotum about four times longer, lateral edges indistinct, raised semi-globosely, and terminating in a stout, oblique, conical spine on each side. The middle dorsal shield extends somewhat beyond the base of the forewings, where the lateral margins ascend obliquely at an angle of about 40°, meeting at a sharp point over the base of the abdomen. The middle of the pentagonal area is occupied by a high lentil-shaped hollow crest, with a circular, notched margin in front and above; its surface is traversed by six distinct main veins starting from the base near the front, which emit a few longitudinal branches, and more numerous but less distinct transverse veins. The sides descend very low, the rounded margins forming a narrow recurved ridge. The meso-and metathorax are much higher and stronger than the prothorax, the sides flat, straight, and separated by deep furrows. The pro- and meso-

sternum are narrow, depressed in the middle, the coxæ surrounded by distinct ridges; the metasternum entirely obliterated by the coxæ of the hind legs.

Legs slender, long; the posterior pair about two and a half times the length of the body, more or less angular. Tibiæ of all and the femora of the hind legs spiny. Tarsi four-jointed, stout; claws long and slender. Auditory areolet oval, large, free.

Abdomen compressed, subconical, twice the length of head and thorax together; segments, ten dorsal and eight or nine ventral, former along medial line overlapping and forming acute points; ventral plates subquadrate, surrounded by a narrow ridge. Anal plate deeply emarginate; cerci short, finely ciliate, and curved inwards.

Tegmina and wings more than twice the length of the body; slope very steep, except that of the interior area of the tegmina, which alone is horizontal in repose. The latter are thin, leathery, translucent, convex in front, concave behind, nearly of equal width throughout, tips rounded, border oblique; the costal area is broadly lanceolate near the base, contracts rapidly, and then narrowly linear to the tip; the inferior area is triangular, broad at the base, but short, being scarcely one-fifth of the total length of the tegmina, and almost wholly occupied by the stridulating apparatus, consisting of several strong longitudinal veins (with slighter ramifications through the transparent membrane) in the right wing, and a very stout transverse vein, with some smaller in the left one. The discal area is several times larger than the others together, and nearly of the same width throughout, except near the base. Subcostal vein very strong, transverse branches stout, often in pairs, ultimate reticulations very numerous, meshes irregular.

Hindwings somewhat longer than tegmina, transparent, and delicate; tips rather acute, border very oblique, interior margin short; thirteen almost straight radiating veins, of which only the subcostal emits oblique branches, all being connected by mostly rectangular, simple, more or loss straight transverse branches.

Hectoria Pontoni, *sp. nov.*

Pale dull green. Eyes dark brown, shining. Crest yellowish-green, margin deep brown to black. Tegmina, costal area with obliquely transverse brown lines and spots; discal area with nine or ten short broad transverse brown bars (some double, others irregular) between the subcostal and medial veins, besides eleven narrowly linear ones beyond the latter, and a number of small spots near the border and interior margin. Legs banded with brown; femora of the anterior and medial legs have three, the tibial two bands, those of the posterior legs four bands each, the last ad-

joining the tarsi, which are also brown. The femora of the fore-legs are smooth, those of the middle and hindlegs with two rows below, the two preceding the last much larger, and connected by a thin high ridge. The tibiæ of the fore and middle legs have two inferior rows, the hindlegs superior, about fourteen in each, and nearly of the same size. All the spines correspond in colour with the part adjoining.

The male nymph is similarly marked, but the darker brown preponderates, while the dull green is replaced by yellowish tints. The imperfect wings are rather long, promiscuously directed obliquely upwards, and closely applied to each other over the back. The crest is nearly as well developed as in the adult. Length of body, one inch ; span of wings, four and a half to five inches.

This genus will have to be placed near to *Phylloptera* and *Phaneroptera*, with which it agrees in general habitus, but it has also through the dorsal appendages some affinity with *Heterodes* and *Megapoda*—in fact, it removes one of the distinctions between the Locustidæ and Acrididæ, viz., the absence of crests in the former and presence in the latter. However, the form of the antennæ, palpi, tarsi, &c., place it unquestionably among the former.

The first intimation of this very interesting insect was received through Mr. J. M. Bagot, who forwarded a nearly mature male nymph to the Museum, obtained in December, 1885, about Terowie. The next, an adult male, was captured by Mr. F. H. Ponton, near Beltana, during the early part of last May. The finder informed me that he captured it in his room one evening, where it, no doubt, was attracted by the light. These are the only specimens known. The female will most likely be little different in general aspect, but furnished with a long ovipositor. The habitual food plant will probably be some of the Melaleuca species or else the Native Pine.

On some South Australian Polyzoa.

By P. H. MacGillivray, M.A., M.R.C.S., F.L.S., Corr. Memb.

[Read June 7, 1889.]

Plate II.

The present paper contains a list of South Australian Polyzoa, which I have recently had occasion to examine. They were mostly contained in a parcel sent for identification from the Adelaide Museum, but include also some given to me by the Rev. Dr. Porter. The total number of species is 64, of which four are now described for the first time. It is hoped that this very imperfect list may serve as a nucleus to which South Australian naturalists will add many of the other species which undoubtedly occur on their coasts.

The Australian seas are peculiarly rich in Polyzoa, from Victoria alone upwards of 360 species having already been recorded. Most of these have been obtained in the neighbourhood of Port Phillip Heads, where, mainly owing to the skill and indefatigable industry of Mr. J. Bracebridge Wilson, a more extensive series has been found than is known to occur in any equal extent of sea elsewhere. There is every reason to believe that parts of the South Australian coasts, notably the Backstairs Passage, when systematically explored, will yield an equally rich harvest.

CLASS POLYZOA.

Order I.—Phylactolæmata, *Allman.*

Suborder I.—Lophopea, *Allman.*

FAMILY PLUMATELLIDÆ.

Plumatella, *Lamk.*

P. Aplinii, McG. Torrens River.

Order II.—Gymnolæmata, *Allman.*

Suborder I.—Cheilostomata, *Busk.*

FAMILY AETEIDÆ.

Aetea, *Lamx.*

A. anguina, Linn., sp. Encounter Bay.
A. recta, Hincks. Glenelg.

FAMILY CATENICELLIDÆ.

Catenicella, *Blainville.*

C. lorica, Busk. Glenelg.

C. ventricosa, Busk. St. Vincent's Gulf; Encounter Bay.

C. hastata, Busk. Glenelg; St. Vincent's Gulf.

C. cribraria, Busk. St. Vincent's Gulf; Encounter Bay

C. rufa, McG.

C. margaritacea, Busk. Glenelg; St. Vincent's Gulf; Spencer's Gulf.

C. elegans, Busk. Glenelg; St. Vincent's Gulf; Spencer's Gulf.

C. Dawsoni, Wyv. Thomson. Some fragments occur which seem referable to this somewhat doubtful species.

C. fusca, McG.

C. crystallina, Wyv. Thomson.

Calpidium, *Busk.*

C. ponderosum, Goldstein, sp. St. Vincent's Gulf.

FAMILY CELLULARIIDÆ.

Cellularia, *Pallas.*

C. cuspidata, Busk.

Scrupocellaria, *Van Beneden.*

S. scrupea, Busk. Some very imperfect fragments.

Menipea, *Lamx.*

M. crystallina. Busk, sp. St. Vincent's Gulf.

M. Porteri, n. sp. Pl. ii., figs. 1—1*b*.

Zoarium dichotomously branched, branches articulated by double tubes. Zoœcia biserial, about 5-7 in an internode, elongated and narrowed downwards; aperture elliptical and occupying about two-thirds of the front, margin slightly thickened; three spines, the lower clavate or bifurcate, on the outer side above, and two simple spines on the inner side; scutum large, lamina expanded, peduncle narrow. Lateral avicularia rare, large, situated on the upper part of a zoœcium, rostrum with a sharp, curved beak, the narrow mandible directed horizontally outwards. No anterior avicularia. Oœcia large, rounded, with a row of round foramina along the upper edge.

This species, which I dedicate to the Rev. Dr. Porter, from whom I first received a specimen, grows in small tufts, not exceeding half an inch in height, on algæ. The scutum is large, somewhat reniform and saccular. The lateral avicularia are rather scarce, many internodes not showing them and others having only one; they are of large size, although not always so

large as that figured. There are no anterior avicularia. The oœcia are large, pearly, and have an irregular row of foramina along the upper edge.

FAMILY SALICORNARIIDÆ.

CELLARIA, *Lamx.*

C. australis, McG. St. Vincent's Gulf.
C. rigida, McG. Kangaroo Island.

FAMILY BICELLARIIDÆ.

BICELLARIA, *Blainville.*

B. grandis, Busk. St. Vincent's Gulf.

STIRPARIA, *Goldstein.*

S. glabra, Hincks.

BUGULA, *Oken.*

B. cucullata, Busk. Brighton; Kangaroo Island; St. Vincent's Gulf.
B. dentata, Lamx.
B. neritina, Linne, sp.

FAMILY FLUSTRIDÆ.

FLUSTRA, *Linn.*

F. denticulata, Busk.

CARBASEA, *Gray.*

C. pisciformis, Busk. St. Vincent's Gulf.

FAMILY MEMBRANIPORIDÆ.

ELECTRA, *Lamx.*

E. flagellum, McG. A very imperfect specimen.

BATHYPORA, *McG.*

B. bicolor, Hincks, sp. (*Membranipora bicolor*, Hincks, in Ann. & Mag. Nat. Hist., Feb., 1881.)

MEMBRANIPORA, *Blainville.*

M. pyrula, Hincks. St. Vincent's Gulf.

AMPHIBLESTRUM, *Gray.*

A. permunitum, Hincks, sp. St. Vincent's Gulf.

FAMILY MICROPORIDÆ.

THAIROPORA, *McG.*

T. Woodsii, McG. Glenelg.

T. Jervoisii, Hincks, sp. St. Vincent's Gulf.

T. Whittelli, n. sp.; fig. 2. Zoarium very narrow, linear, adnate. Zoœcia in regular transverse series, elongated, quadrate, separated by distinct thickened margins, membrano-calcareous in front, with a large transverse bullate enlargement immediately below the mouth; mouth rounded above, slightly narrowed below, a small mamilliform process on one or both sides.

I have much pleasure in associating Dr. Whittell's name with this elegant species. Its generic position may be somewhat doubtful, but its characters agree on the whole with those of the other species of *Thairopora*, from which it chiefly differs in the large bullate enlargement below the mouth. In the youngest zoœcia this part of the cell is marked off by a fine transverse ridge, between which and the mouth the enlargement becomes developed. It has no communicaiton with the main body of the zoœcium. The transverse arrangement of the zoœcia occurs also in *T. dispar* and *T. Woodsii*. The mouth is placed on a somewhat lower level, and slopes slightly backwards. I have only seen the specimen figured, and an examination of others would be desirable.

FAMILY CRIBRILINIDÆ.

CRIBRILINA, *Gray.*

C. monoceros, Busk. St. Vincent's Gulf.

FAMILY MICROPORELLIDÆ.

ADEONA, *Lamx.*

A. foliacea, Lamx.

A. cellulosa, McG.

A. grisea, Lamx.

ADEONELLOPSIS, *McG.*

A. foliacea, McG. Encounter Bay.

A. Zietzii, n. sp.; fig. 3. Zoarium encrusting. Zoœcia irregularly arranged, ovate, distinct; mouth subcircular with the lower lip hollowed, or semicircular with the lower lip nearly straight; surface tubercular and perforated, usually a large nodular mass below the mouth, and occasionally others similar at the sides; zoœcial pore subcentral, entire, or stellate. Oœcial cells large, surface with large nodosities round the margins, especially above, pores usually two or three, stellate, in a central depression; mouth wide, arched above, straight and projecting forwards below. St. Vincent's Gulf.

The specimens examined surround the stems of a small alga. They are of a leaden grey colour, owing to the presence of a rather thick epitheca. The whole surface is rough with small rounded nodules, among which, when the epitheca is removed by incineration, numerous small rounded foramina are seen, especially along the margin. There is usually a large, glassy nodule between the lower lip and the pore which it frequently overlaps and conceals. Other larger ones are also common to the sides of this and towards the margins of the cells. The pore is small and plain or slightly stellate. The oœcial cells are very large, with numerous large nodules either round the whole margin or confined to the upper part, leaving a central depression in which are one or several stellate pores. The mouth is very wide, not so lofty proportionately as in the others, and has the lower lip straight or slightly convex. In many of the zoœcia at the lower edge of the suboral nodule is a minute avicularium with the point of the mandible directed upwards and the base resting on the pore.

FAMILY ESCHARIDÆ.

Schizoporella, *Hincks.*

S. schizostoma, McG. St. Vincent's Gulf.

S. triangula, Hincks. Glenelg; St. Vincent's Gulf. The specimen of this occurs in the Hemeschara-form.

The zoœcia are very irregular in size and shape, confusedly arranged and separated by prominent raised lines. The oœcia are abundant and very characteristic. The lower edge is produced downwards into one or more blunt processes, while a similar, sharper process rises upwards from each side of the zoœcial oral notch.

S. lata, McG.

The specimen of this species occurs as a beautiful branched and astomosing tube, which has evidently been moulded round a sponge, of nearly three inches in greatest extent, the diameter of the tubes being in some parts a quarter of an inch.

S. biturrita, Hincks. Brighton.

Parmularia, *Busk.*

P. obliqua, McG. St. Vincent's Gulf.

Smittia, *Hincks.*

S. Landsborovii, Busk. Kangaroo Island.

S. trispinosa, Johnston, sp.

The only specimen of this species is bilaminate, and forms a beautiful foliated ribbon-like zoarium extending up and round the narrow stem of a black alga for a distance of about three

inches, the ribbon at its widest part being about half an inch. The orifices of the marginal zoœcia are nearly circular, with a prominent denticle ; in the older the peristome is much produced as in the var. *bimucronata*. The avicularia, when present, are usually large, by one side of the mouth, with the mandible pointed downwards. There are numerous oœcia with large perforations.

MUCRONELLA, *Hincks.*

M. Ellerii, McG. St. Vincent's Gulf.
M. papillifera, McG.

ADEONELLA, *Busk.*

A. platalea, Busk. St. Vincent Gulf.

FAMILY CELLEPORIDÆ.

LEKYTHOPORA, *McG.*

L. hystrix, McG.

CELLEPORA, *Fabricius.*

C. lirata, McG.
C. cidaris, McG.
C. verrucosa, McG.

SCHISMOPORA, *McG.*

S. costata, McG.

FAMILY RETEPORIDÆ.

RETEPORA, *Imperato.*

R. phœnicea, Busk. Kangaroo Island.
R. monilifera, McG., var. *sinuata.*

R. monilifera, form *arcuata.* A specimen occurs differing especially in the oœcium which it is desirable to distinguish. The zoarium, about three and a half inches in longest diameter, forms a tubular and calyculate mass. The fenestræ are oval, narrower than the trabeculæ. The peristome of the zoœcia is produced with a loop-shaped notch, on one side of which is a rounded avicularium. There are also frequent elliptical avicularia on the front of the zoœcia, and horizontal avicularia on the inner edge of the lower part of the fenestræ. The oœcia have an arched or angled beaded line or stigma without vertical extension. The posterior surface is faintly vitricate and granular, with small elliptical avicularia, especially towards the margin of the fenestræ.

I am not satisfied that the forms I have described as *munita* and *umbonata* should not rather be considered as species, in which case this would take similar rank.

SUBORDER II.—CYCLOSTOMATA, *Busk.*

FAMILY CRISIIDÆ.

CRISIA, *Lamx.*

C. acropora, Busk. St. Vincent's Gulf.

FAMILY IDMONEIDÆ.

IDMONEA, *Lamx.*

I. radians, Milne Edwards.

I. Milneana, d'Orbigny.

SUBORDER III.—CTENOSTOMATA, *Busk.*

FAMILY VESICULARIIDÆ.

AMATHIA, *Lamx.*

A. australis, Tenison Woods.

A. pinnata, Kirkpatrick.

A. distans, Busk. Of this I have examined two small specimens, not very perfect, but still sufficient to show their identity with the form described from off Bahia in the Challenger Polyzoa. It is readily distinguished from our other Australian species by the series of zoœcia describing a single—sometimes not quite complete—spiral round the upper half of the internodes.

VESICULARIA, *J. V. Thomson.*

V. bilateralis, n. sp.; fig. 4. Zoarium cylindrical, confervoid, branched, articulated, each internode giving origin to three arranged in a verticillate manner. Zoœcia disposed in two thickly clustered series on opposite sides of the branches, occupying the whole length except for a short distance at the base; ovate, length 0·4 mm., diameter about 0·25 mm.

The only specimen I have seen is probably a fragment of a larger mass.

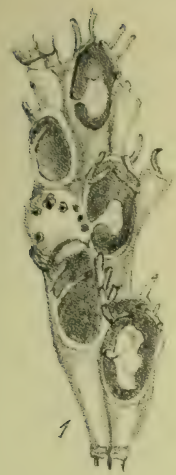
EXPLANATION OF FIGURES.

Figs. 1 and 1*a*. *Menipea Porteri*, front view, magnified. Fig. 1*b*. Posterior view of same.

Fig. 2. *Thairopora Whittelli*, natural size. Fig. 2*a*. Two young zoœcia near the growing end, highly magnified. Fig. 2*b*. Two series farther back, showing fully-formed zoœcia.

Fig. 3. *Adeonellopsis Zeitzii*, two zoœcia, magnified. Fig. 3*a*. Small portion magnified, showing zoœcia and oœcial cell.

Fig. 4. *Vesicularia bilateralis*, natural size.



1

1a

1b

2a

2b

3

2

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On the Geological Structure and Physical Features of Central Australia.

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Plate III.

TOPOGRAPHY.

In following the Overland Telegraph Line northward from the Flinders to the Macdonnell Ranges, the route traverses the Lake Eyre basin, and ascends a gentle slope to an elevated region in the heart of the continent.

Three principal divisions of country present themselves along the route, and may be termed—

I. "The Great Austral Plain."—A vast region of inconsiderable elevation, with some portions especially low-lying, and descending at the surface of Lake Eyre to about 20 feet below sea level.

II. "The Terraces." — The slopes and low parallel ranges which border the plain and form, as it were, a flanking terraced formation to

III. "The Great Central Plateau," whose furrowed southern face develops the system of narrow ridges collectively known as the Macdonnell Ranges.

Within the first division, and west of Lake Eyre, stands the Denison or Peake Ranges. They rise like islands from out of a plain of sands and clays, and are outlying portions of the Flinders Range.

I. The Great Austral Plain.

The surface contour is a level plain, with the horizon in every direction more or less broken by low flat-topped hills of uniform height, shaped like truncated cones, or else a low precipitous bluff, uniform in height with the cones, and forming the escarpment of a small "tableland" a few miles in area.

The hills and bluffs are almost destitute of vegetation. The arborescent growth is limited to acacia bushes, a stunted Eucalypt locally termed the "Box" or "Coolibah," and the crooked "Gidgia," a wonderful specimen of vegetable contortion; whilst on the plain, trees are rarely seen, but the hardy saltbush and cotton-bush abound for miles. Large patches of the level plains near the hills are perfectly sterile, and are covered with a

layer of smooth, glazed, rounded or subangular stones, set so closely together that the appearance is not unlike a pavement. The bare patches, or "gibbers," alternate with less stony or sandy areas and small shallow depressions, termed *claypans*. Where the stones are absent the saltbush abounds, and on the sand a few small bushes maintain a precarious footing; but the claypan is smooth and bare, the edges usually margined with a growth of samphire, and the surface white with a coat of salt-efflorescence.

The southern portion of this region presents its most extreme character, and is met with immediately after leaving the north termination of the Flinders Range.

As might be expected, this basin being the receptacle of a vast drainage area, there are some immense watercourses, which conduct the occasional flood waters to the lowest levels; but so gentle is the slope, and so local and irregular is the rainfall, that it is not an uncommon circumstance for the lower portions of the channels to be destitute of running water for years together. In fact, throughout the great plain a mild drought may be considered its normal condition; but heavy rains around its edges may send down a flood exceeding the capacity of the lower channels. Then the country becomes inundated for miles on either side; billabongs, saltpans and all depressed portions are filled to the brim, and the non-absorbent character of the clayey soil permits these waters to remain for long periods—perhaps till another flood—and furnish the only supplies of surface waters that man and beast can obtain.

After such an inundation the aspect of the country undergoes a complete and wonderful transformation. The dreary monotonous waste, which formerly only reflected the heated rays of the sun and the landscape of mirage and uncertain outline ever varying amid the air currents,—the very sight of which intensified the arduous nature of the traveller's journey, and begat an involuntary sense of fear and shrinking,—is succeeded by a magic growth of beautiful green sward, from out of which rise "geraniums," "parakylia" and succulent herbs delightful to animals and gratifying to man.

It is but for a short time, however, that the desert thus "blossoms as the rose." The great heat following after moisture induces a rapid growth, but only of ephemeral existence; and after a bush fire, or the more slow wasting due to natural causes, the country relapses into its normal condition.

The foregoing is especially true of the country east of Lake Eyre, where the Barcoo or Cooper's Creek brings down the storm waters of the Queensland coast range. From the slopes near Carpentaria, in the north, the flood waters follow the ill-defined channels of the Diamantina and Mulligan, while from the slopes

of the west and north-west, which reach to the summits of the Musgrave and Macdonnell Ranges, the waters come down the deeper channels of the Neales, Macumba, and Finke. Seldom, however, do the waters of those last-mentioned three creeks run right through to the lake. Their channels contain so much sand that the flood is absorbed before it has completed half the length of its course.

In fact, with regard to the longest and most important of these creeks—the Finke—it is extremely doubtful whether its waters ever reach the lake, but are not rather absorbed by the interminable waste of sandhills which lie along the west side of the Queensland border.

In the region lying south and south-west of the lake, the creeks are short and situated throughout their length in a country of exceptionally small rainfall, consequently this portion of the great plain presents the most arid and least-inviting part of its surface. This region would be altogether impassable to travelling stock, if storm waters were the only supplies obtainable, but at intervals forming easy stages the beds of clay of the plain yields to the pressure of waters beneath ; and so at numberless points, the sites whereof are indicated by a low limestone mound, there is an oozing out of water sufficient and unfailing for the requirements of stock, but insufficient to create a running rill extending beyond the base of the mound. There it is either absorbed almost immediately, or a small reed-fringed pool may be formed, according to local circumstances or the amount of water issuing forth.

The belt of country containing these springs reaches from Hergott Springs all round the south and west sides of the lake. They become less numerous and more isolated as the distance increases westward or north. Dalhousie Springs is an outlying system to the northward, and is situated on the edge of the sandhill country in which the Finke loses itself.

All the country in which the springs occur has nearly the same relative level and, excepting the actual surface of Lake Eyre, is the lowest portion of the great plain.

Leaving the Spring Country and ascending the watercourses, the table-topped hills become more numerous and outlie more extensive areas of tableland. The plains or level parts are not so extensive, and the sandhills are a prominent feature only along the main valley bordering the channel. Patches of scrub, principally composed of mulga *(Acacia aneura)*, with occasional Casuarina (desert oak) and Eremophila, make their appearance. At first alternating with open grassy plots, the scrub gradually becomes more and more the prevailing feature as the limits of this first division of country is reached. Still higher up the creeks, their channels become deeper and more like gorges cut into the

tableland, whose surface is either stony or sandy, and whose edge is terminated by a bluff escarpment over-looking the lower plains, dotted with outlying detached flat-topped hills and patches of formerly-connected tableland.

II. The Terraces.

The second division of the county commences about eighty miles south of the Macdonnell Ranges, and consists of a number of parallel ranges of low altitude separated by broad valleys or plains. Each range and plain to the northward being higher than its neighbour to the south, their general aspect is that of a series of terraces constantly rising with a gentle and imperceptible slope to the foot of the great plateau whose southern edge forms the ridges collectively known as the Macdonnell Ranges.

The two great creeks, the Hugh and the Finke, which rise in the Macdonnells, run southward over this system of terraces and junction just on the edge of the Great Plain. Each has a channel as broad as the Murray at Morgan, and throughout their length the beds are filled with clean white sand as fine as that of the sea-shore. Large gum trees grow thickly on either side leaving only the mid-channel clear.

Such is the character of the numerous watercourses, which are marked on the maps as rivers, but whose real character is disguised under an equivocal name compounded of its patronymic and the definite article only. Thus we have not the *River* Finke, *River* Goyder, &c., but *The* Finke, *The* Goyder, *The* Macumba, &c., concerning which the observer must use his own intuitive perception as to whether it is a river, nullah, or gorge.

Water, whose presence might reasonably be expected on account of the vigorous tree-growth, is readily obtainable by sinking in the sand, while at a few localities local circumstances cause the water to appear at the surface, where its presence is immediately betrayed by a growth of rushes.

Explorers' routes were, of course, along these creeks, and the trade route naturally keeps in the same track.

The Ranges, as a rule, are densely wooded from base to summit by Mulga-scrub, except in those situations where bare rock or a cliff face renders vegetation impossible. A fig-tree is met with; and in the Finke channel below the Macdonnells, a glen is so productive of a *Livistona* that it has been named the "Glen of Palms." The plains between the ranges are mostly covered with mulga-scrub, comprising besides mulga, sheoak, myall, Grevillea, Hakea, and a peculiar looking Eucalypt *(E. gamophylla)*, locally termed "apple tree." The soil is usually a sandy loam, fairly grassed, but where open spaces of

sandhills occur the sands are bound together by the odious spinifex *(Triodia irritans)*, which grows in tufts about two feet in diameter.

This system of parallel ranges borders the Macdonnells on the south side throughout their whole extent. The drainage is to Lake Eyre, except the extreme western portion, which trends towards Lake Amadeus, another basin analogous to Lake Eyre, but at a higher level, being about 600 feet above the sea. The slope of which this division is formed may be considered to range from about 1,000 feet above sea at its lower edge to about 2,000 feet at its upper limit where it abuts on the Macdonnell Ranges.

III. The Central Plateau.

This plateau, of which the Macdonnell Ranges forms the southern face, is of a triangular shape, as far as its limits are at present known. The apex terminates between Alice Springs and the Queensland boundary, but towards the base it extends into regions still unexplored. Its mean altitude verges close on 3,000 feet, and the highest points are along the Reynolds and Strangways Ranges to the northward of the Macdonnell system, Mount Gardiner, in the former range, rising over 1,100 feet above the plain at foot, as determined by Mr. W. C. Gosse. The Reynolds Range, prolonged through the Strangways and Hart Ranges, has a general direction of E.S.E., while that of the Macdonnells being nearly east and west, a convergence of the two systems takes place in that section termed the Hart Ranges. The creeks originating in the Macdonnells, except those near the western end, run down into the Lake Eyre basin. The western drainage is towards Lake Amadeus, and it is probable were the supply of running water sufficient a large creek would traverse the whole length of the elevated plain between the Macdonnells and Reynolds Range and rounding the Macdonnell's western end fall into the Amadeus basin. North of the Reynolds Range the Lander, Hanson and Woodforde Creeks lose themselves on the plateau, but more eastward still the creeks originating on the north slopes of the Strangways and Hart Ranges being united into two large channels—the Sandover and Plenty—after a short northern course turn eastward, and rounding the apex of the plateau, enter the long sandy trough descending to Lake Eyre, and in which the main line of drainage is termed the Marshall River. This trough is a most desolate region of sand and spinifex, and appears to swallow up all the waters brought down by the Finke, Todd, Elder, Illogwa, Plenty and Sandover Creeks, which drain two sides of the great plateau. The tropic of Capricorn passes over the plateau just north of the Macdonnell ridges, and as might be expected of a region thus elevated under the

tropic, but in the heart of the continent, the climate partakes of the extremes of moist heat and cold dryness. The moisture is brought by the monsoon winds, which follow the sun down from the north coast, but the intense cold is due entirely to radiation under a clear sky after the monsoon has abated. At the head of the Hale River on the 11th September the thermometer ranged from 85° F. during the day to 19° F., or 13° below freezing, during the night. No snow or hoarfrost ever accompanies this cold, because there is not sufficient condensable moisture present in the air. Humidity follows on the great heat, and then is precipitated in torrents of rain, accompanied by electrical disturbances.

Vegetation of special nature only could withstand such climatic vicissitudes, and for this reason the perennial plants are few in species, though individually numerous and identical with those found in the terraced ranges to the southward.

The rainfall of the plateau, expressed in terms of mean annual average, is not suggestive in itself of aridity or drought, but when it is considered that this rainfall, though amounting to from 15 to 20 inches, falls in torrential showers of short duration, while the normal climatic conditions are those of excessive evaporation, it is immediately evident that the country's surface cannot partake of that moist condition essential to the continued growth of herbage. Beyond this also is the occurrence of long intervals without rain, when the only surface waters are those of some rock hole in a gorge whose precipitous sides shut out the sun's rays, or a hollow scooped in the creek sands by an eddy due to a projecting ledge of rock, marking the position of a rocky bar across the channel.

The creeks on the plateau are short and shallow, and at a few miles from the ridge, which gave them birth, they become lost by spreading over the level country. The plateau is a most arduous stage for travellers. Three times did Stuart essay to cross it before he succeeded, and still later Warburton and his party striking westward, fleeing as it were for their lives, succeeded in crossing it, possessed indeed of their lives, but destitute of almost every other thing with which they started. To the westward the scrubs give way to sand and spinifex to within the West Australian borders, but the north-west limit of scrub which turned back Stuart is unknown. Descending the eastern slope of the plateau, at no great distance from the telegraph line the traveller is again on the great Austral plain, so called first by Favenc, who crossed it from the coast range of Queensland through its full width to the plateau on which runs the telegraph line. The great plain there is a smiling country now rapidly becoming covered with cattle stations. The portions lying within South Australian territory is well known to the commercial world as the Herbert

River country, and is frequently said to be one of the best pastoral regions in Australia.

GEOLOGICAL STRUCTURE.

Outliers of the Flinders Range.

Soon after leaving Beltana in journeying northwards, the Flinders Range begins to break up, and except for the prolongation of the main chain towards Blanchewater and a less important spur towards Mount Nor' West, the primary rocks of which they are formed are lost beneath the gypseous clay formation of the Great Plain. Passing round the south and west sides of Lake Eyre, and ascending as high as the Neales River Valley, five outcroppings of granite and metamorphic rocks are met with. By their strike, sequence and composition, as well as their actual location, there is little reason to doubt but that they belong to the same system as the rocks forming the Flinders chain. The outcrops are :—

1. Finniss Springs.
2. Mount Margaret.
3. Peake.
4. Algebuckinna.
5. Mount Dutton.

Each of the localities are on a line, which, while running northward, recedes also to the west, so that the general direction of a line connecting them would be N.W. and S.E.

1. Finniss Springs.—At this locality a ridge of quartzite forms a low continuation of the Mount Nor' West Range prolonged through Hermit Hill. It forms good building stone, and from it the culverts and railway buildings along the line have been constructed.

2 and 3. Mount Margaret and Peake Ranges.—The outcrops at Mount Margaret and the Peake form the basal portions of the Denison Range, which runs from Anna Creek Station to Mount Kingston North, a few miles north of the Peake Telegraph Station. This range is of irregular outline, and composed of two very distinct systems of rocks. The uppermost series is a friable, white, sometimes chalky-looking, sandstone of considerable thickness, the upper portion being the most compact. Under it is a stratum of ferruginous cement, at times enclosing fragments of white and opaline quartz, at others being built up of ironstone nodules several inches in diameter, but which are simply crusts filled with white siliceous sand in a minute state of subdivision. This band of cement is but from a few inches to about five feet in thickness, and in turn rests on sandy argillaceous beds which graduate into a brittle blue clay weathering to olive-green in

colour. The whole series is horizontally stratified, and covers the primary rocks of the ranges to an altitude of about 400 feet above the sea. From about three-fourths of the eastern side of the range the country has been denuded deeply into the clay bed, which constitutes the plain extending to Lake Eyre. A remnant of the horizontal beds in places still clings to the face of the range, and a few flat-topped hills in the plain attest the depth of eroded strata. From Anna Creek to the Douglas the lower rocks are occasionally exposed by the almost complete removal of the sandstone and ironstone beds, but at Davenport Creek a sudden uprising of the strata takes place and culminates in the summit called Mount Margaret. This upraised ridge and the mount itself rise clear above the horizontal beds which fringe them. From Anna Creek to the Douglas the formation consisted of quartzite (very dense), sandstones and slates, the whole traversed by dykes of white felspar. Thin covering patches of the flat bedded sandstone and ironstone occupy the hollows between the undulations. The ranges are almost bare of vegetation, and standing on one of the peaks nearly east of Mount Margaret I could distinctly make out the strike and dip of the lower beds and their relation to the horizontal ones of the table lands. Mount Margaret is near the centre of an area of great dislocation and faulting. The southern ridge rises steeply from the eastward, and up its face of 200 feet I counted thirteen beds of brown, fine-grained, or compact quartzite intercalated with beds of talcose or mica-slate. The whole series dipping west at an angle of about 50 deg. The creeks which originate north of Mount Margaret run out eastward through gorges which give good natural sections and show the lowest bed to be a thick bed of conglomerate, formed of boulders of hornblendic, chloritic and micaceous schist cemented together by lime. In the cliff sections numerous caverns are seen, some large enough to contain three or four horsemen. They seemed caused by the dislodging of a nest of boulders by water filtering out from the sides of the gorge. Chloritic and talcose schists lie above this bed, and are succeeded in turn by the brown quartzites and talcose slates as displayed in the southern spur. Numerous dykes of granite containing very little mica or quartz seem to have been the first disturber of the strata, while a second disturbance was afterwards caused by extensive eruptions of syenite frequently so quartzose as to be termed a quartz-syenite. This quartz-syenite forms low hills about seven miles out on the plain north-east of Mount Margaret, at the base of which are some springs rising through the clay, whence the hill is termed Spring Hill. North of Mount Margaret the swelling, of which it is the culminating summit, again sinks down to the

level of the ironstone table-land and continues to Mount Denison in the Peake system of rocks. The metamorphic rocks of this system have the form of an arrow with its point to the southward. The Mount Kingston ridge represents the shaft while the quartzite ridge from Coppertop Hill to Mount Denison and thence north-west again to Peake Creek represents the barbs. Quartzite of reddish white colour, massive and compact, is the highest member of the series here. Under it are argillaceous, chloritic, micaceous and hornblendic schists, with bands of crystalline limestone which weather black on the surfaces, revealing small fragments of schist incorporated with it. Numerous outcrops of a coarse red granite with large felspar crystals intersect the strata, which have a most confused strike and dip, due to the granitic and syenitic eruptions which have taken place. South of the Telegraph Station the granite contains white mica and tourmaline in fair-sized black crystals. A sectional line across the ranges from Peake Telegraph Station shows three ridges, the first granite and schist, the second syenite of grey colour and schist, and the third of quartzites and talcose slates in thin bands, as seen forming the highest beds at Mount Margaret. Dykes of diorite of small dimensions traverse the schists and small veins of quartz containing oxide of copper and secondary formations of atacamite are common, but I saw nothing worth following up as a probable continuous metallic vein except the exposure to the west of the Telegraph Station. The sectional drawings will best convey the relative sequence of the rocks forming the ranges and the table-land deposits which occur in their hollows or on the flanks of the range. The line of the Peake Creek as it comes through the range is evidently that of a great fault, wherein the range and its granite core have been disturbed by subsequent forces. On the middle ridge, west of the Peake Station, are some fragments of schistose rocks forming a breccia-capping to the hill. The fragments are angular and evidently not waterworn to any very appreciable extent.

4. Algebuckinna. — Where the telegraph line crosses the Neales River schists are seen, traversed by granite and quartz-syenite-dykes ; in the schists are pale garnets of small size, and some strings of rich copper ore similar to that at Peake ; large reefs of magnetic iron accompany the syenite. The channel of the creek has an exposure of metamorphic rocks, &c., for about two and a half miles in length. The banks of the channel are about 90 feet high, and about one mile apart. The sectional drawing shows the bank to be composed of impure kaolin resting directly on the metamorphic series, having overlying beds of coarse and fine gravel, with thin clay partings, and the whole capped by a six to 12 feet stratum of very hard, coarse-grained,

brown sandstone, which breaks with a sharp cutting edge. In solution of potash it becomes friable after long digestion. This place is known as Algebuckinna goldfield, and was first discovered during the telegraph construction, but the discovery was not disclosed to the public till about two years ago. The actual channel of the river is filled with a drift of alluvium about 18 feet deep where deepest sinkings have been made, but the locality being one of those few places where waterholes occur, the influx of water prevents full exploration. The gold of this recent alluvium is apparently derived from the coarse gravel stratum overlying the kaolin, as gold is found in it, and the richest finds have been made in the talus immediately under it. The gold is very pure, and brought £4 per ounce at the Melbourne Mint. In appearance it is sharp, and the presence of crystals of black ironstone embraced among its projecting parts proves conclusively that it has not travelled far. About three miles up stream is the Ockendon Creek, which junctions here over gneissoid schists, among which are quartz leaders carrying pyrites ; and possibly it is from this locality that the gold has been derived, although I could not detect gold in the quartz I examined. Ten miles north-west of Algebuckinna is the

5. Mount Dutton Range, which lies about ten miles north-west of Algebuckinna, I did not visit ; but as our route passed within two miles of its northern end, I was enabled to distinguish a succession of beds in appearance like those of the Denison quartzites and slates.

This was the last exposure of metamorphic rocks for the next 350 miles, and the conclusions warranted from the examination of their series are the following :—

1. They are probably outlying portions of the Flinders Range, as their rocks agree in strike, sequence, and mineral composition with that portion nearest the plains.

2. They are probably a chain of archæan islands which occupied a shallow sea, as evidenced by the conglomerate beds or breccias, the thick beds of quartzites, and continuous bands of limestone, in which schistose fragments are imbedded (though only perceptible when weathered).

3. After deposition of the schists, granitic eruptions raised the beds into ridges running nearly north and south.

4. Great erosion took place before the second period of eruptive rocks were intruded, and their action faulted, dislocated and greatly contorted the whole system ; and as the mineral deposits are always in their vicinity, they were probably the mineralising agents of the system.

5. After another long period of erosion, during which the ranges received in great measure their present contour, a period

of depression followed, during which the table-land formation of clays were deposited on all points except the actual crests of the range.

6. Another uprising ensued, since which the table-land deposits have been continually undergoing removal, and now only portions remain flanking the range. Of this the eastern side, being on the side of quickest drainage, has almost disappeared, while the western side is still sufficiently continuous to form a great proportion of the range.

The Great Austral Plain.

We have already some knowledge of portions of the great plain through the geological observations made by the geologists of the the adjoining colonies near our boundary line, and public works undertaken by our own Government along the shores of Lake Eyre.

Long previous to the official statements recognising the Mesozoic age of the Lake borders, Professor Tate, then President of this Society, had critically examined all available data connected with the region, and declared positively in his anniversary address that a large Mesozoic formation, probably of Jurassic age, occupied a large part, if not the whole, of the Lake Eyre basin. Since then the deep bores of the Water Conservation Department and the continued collection of fossil evidence from various localities have changed the presumptive into positive, and we now know that the Tertiary and Cretaceous formations which extend west of the East Coast Range not only cross our boundary from the eastern colonies, but there is good reason to believe that in the latitude of Lake Eyre, at least, they extend right across our whole province. The furthest westward from which fossils have been obtained from this formation is on the Arkaringa Creek, about 70 miles west of the Peake, from which place a splendidly preserved portion of a cast of the *Crioceras australe* was procured by my brother (Mr. W. H. East), and through me presented to the museum of the Adelaide University, where it now is. Curiously enough, the only other specimen yet discovered is from the Flinders River, in Queensland, on the counter slope of the great plain, where its drainage turns towards the Gulf of Carpentaria. Fossils identical with those occurring at Mount Margaret were obtained by me from Dalhousie Springs ; and at Mount Daniel, about 18 miles north of Charlotte Waters, I obtained *Lingula suboralis* and a piece of silicified coniferous timber which had been drilled by Xylophagas. A most remarkable feature throughout the whole region is the remarkable uniformity of the beds both in sequence and composition, This is well illustrated in the sections

of different localities naturally displayed, and in a manner most unmistakable.

The flat-topped hills and tablelands, which without seeming method or system occur throughout the whole of the Cretaceous basin now under discussion, are but remnants of the one vast deposit, now in part removed, but of the nature of which their faces are the typical sections.

The lowest stratum disclosed is a bed of blue clay, greenish when weathered, and more or less sandy in its upper portion. It lies horizontally, or nearly so; the clay is brittle and very retentive of water, and at considerable depths in it are thin seams of limestone made up of shells and casts, which are so brittle that an attempt to extract any probably results in destroying the specimen. Spheroidal masses of argillaceous limestone up to two feet in diameter are frequent; they do not contain any fossil remains, and are usually coated with a thin layer of gypsum. In fracture they break into perfect segments, proving the homogeneity of their structure, and that the form is not due to abrasion. The colour is "dark stone," but in thin edges of a translucent "honey colour." Gypsum is abundant in thin plates; it is to be remarked that I seldom met with it among the fossils, or rather the fossils seem to be situated down in the clay beds *below* that portion in which the gypsum is developed.

Above the blue clay is a stratum of argillaceous ironstone in form of nodules, concretions and thin sheets. It varies in thickness from a few inches up to ten or twelve feet, and seems to have been formed in fine sand, for most of the nodules are simply cases filled with white sand. On exposed places these nodules by weathering permit the escape of the sand, and then the aspect of the deposit is that of scoria from a huge smelting furnace. Near the Peake Range, this belt of ironstone is charged with fragments of semi-opal and quartz, and might fairly be termed a conglomerate rock. The quartz is evidently derived from the veins among the schists, forming the mass of the ranges, and is coarser the nearer the ranges are approached.

Above the ironstone band is a stratum upwards of 200 feet thick of a friable white sandstone composed of clear white grains of sand cemented together with an argillaceous paste. At times the paste is in excess, and then the faces of the hills and bluffs have a white chalky appearance, and sometimes, though rarely, contain gypsum in the portions near the ironstone band. Towards the top the grit becomes more compacted by infiltrated silica, and the top is composed essentially of a capping of porcellainised sandstone from one to six feet in thickness; in fracture it is evidently a sandstone, and the weathered surface has always a glazed appearance and superficial staining by oxide of iron.

When this capping surmounts a portion which is more argillaceous, the siliceous hardening and glazing gives it the appearance of baked earthenware. Veins of chalcedony are common among the planes of shrinkage, and nests of the same material furnish the so-called flint fragments which are so common throughout the region. This chalcedony varies from pure translucent specimens to the porcelainised sandstone just referred to, and it is easy to select pieces showing the different stages of transition.

This gritty bed represents the surface of the country before it was exposed to the erosive action of running water, and the height of the flat-topped hills attest the depth to which the creeks and wind have changed the contour of the country. From Charlotte Waters to Lake Eyre the erosion has extended down through the grits and for some distance into the blue clay, being deepest in the latter bed as Lake Eyre is approached. As a consequence the nearer the lake the greater is the exposed or uncovered surface of the clay through removal of the grits; the only vestiges of which now are the porcelain stones and ironstone nodules which constitute the "gibbers" or stony patches referred to previously as forming a feature of the surface of the great plain. Along the railway line at present constructing the only stone available for ballast are the gibbers, and but for their existence ballast would require to be brought from places beyond the plain. As it is they are cheaply and expeditiously raked together and wheeled on to the embankment.

This continuous bed of clay, whose surface is below sea level at Lake Eyre, abuts directly against the ancient rocks which form the Flinders Range and their extension north-westerly to the Peake and Mount Dutton, which thus forms the southern edge of the basin which encloses them. Northwards the clay-bed extends into regions where the rainfall is considerable and the ground more elevated, but over which water seldom runs at the surface. At whatever point, therefore, the lower side of this bed is brought near the surface of the ground, opportunity is afforded for waters to percolate below. This water having percolated to the limits of the basin, where it is bounded by impervious beds of older rock but little jointed, must necessarily remain pent under considerable hydrostatic pressure, which at length overcoming resistance, forces a way up through the clay in the neighbourhood of its abutment against the old walls. Lime is deposited around the mouth of the orifice as soon as the water comes to the surface, and the pressure eased. In this manner a mound is built up of travertine, which increases in dimension until the hydrostatic pressure is compensated, or, what is still more probable, until the orifice is closed by continual deposition along its sides, and then another spring breaks out at a lower level.

Iron is frequently present in the waters, and being also deposited in presence of decaying vegetation which accumulates at the spring among the crevices of the calcareous tuft, it has assumed a yellow ochre appearance not unlike powdered sulphur, for which, indeed, it was taken to be at a time when the origin of these springs was supposed to be volcanic.*

The temperature of the waters is variable in different localities, that of the three springs at Dalhousie Station was 73°, 79°, and 93° F., but I was informed that the largest one some miles northward was quite as hot as the hand could bear without suffering, though, like those at the station, perfectly palatable and tasteless.

The fact of the creek channels having cut down to the bed of retentive clay is the cause of many of them having large though not deep waterholes. Such an one is Algebuckinna ; the Angle Pole waterhole is another ; the Ross at Macumba and the holes at Charlotte Waters are other instances; and as a general premise it may be said that the deeper down in the bed the less sand, and consequently better holding ground obtains.

At Mount Daniel the sandy clay in which fossils occur is a yellowish one, speckled green with what is probably glauconite grains. The shells and wood are silicified, and jointing planes or shrinkage cracks are already coated with a thin film of porcelain. The channel of the Goyder separates this hill from Mount Townsend, which stands on the bank of the Finke, and displays well the usual section.

After leaving Mount Daniel and ascending the Finke channel the upper bed or sand grit gets thicker. The Finke being the main drain of this region should yield the best cliff sections. About a mile above Crown Point cattle station is Cunningham's Gorge. In this same grit and immediately above this gorge, the channel is strewn with large boulders of red granite, well rounded, and also some masses of a porcelain breccia, enclosing argillaceous schist fragments of several inches extent. No bed rocks are exposed in the channel, which seemed to be all of argillaceous beds surmounted by cliffs of porcelain-capped grits, and I looked in vain for some break in the country indicating a change of formation. As some of the boulders weigh about a quarter of a ton they cannot have been washed from any great distance, and I think most probably a bar of primary rocks representing an ancient ridge here comes up to the surface, but has now been eroded away or covered by the sandhills which obtain for the next 20 miles to the northward. This seems probable, because at 18 miles higher up stream the cliff section reveals a

* This substance was examined in the University laboratory by Mr. A. W. Fletcher, and found to be persulphate of iron. On ignition it gave off a slight odour of burnt organic matter.—EDITOR.

ridge of argillaceous and hornblendic schists, having a central core of red granite, crossing the county in an E.N.E. direction, but which is covered by at least 70 feet of wind-drifted sandhills. Approaching this exposure the cliff banks are clays and sand-grits, very micaceous, and abounding in gypsum slabs. The flat-topped hills stand back some distance from the channel, as shown in the sketch. Rolled granite boulders occur on top of the dyke and on the schist below, evidently having been worn by water. The channel is over a quarter-mile wide, and the depth from top of the sandhill to surface of the sand in the creek is about 125 feet by aneroid. The clay bed rests against the schist almost horizontally on either side, and on the up-stream side the water is impounded by the bar of schist, and is the cause of the small holes called Polly's Springs. There is so much salt in the clay, however, that it contaminates the water and renders it almost undrinkable and highly purgative. In the lower part of the schist or near the granite dyke a thin band of argillaceous schist is completely impregnated with almost microscopic specks of green copper ore. An assay of the rock by the Government assayer gave about ·18 of a per cent. of copper. The upper portions of the schist are argillaceous and intercalated with narrow bands of brown quartzite, similar to that in the higher beds of the Denison Range at Mount Margaret.

Thirty miles N.W. of this dyke, over loamy plains dotted with porcelain-capped hills, lead to the bank of the Finke, overlooking old Idracowna station. The cliff banks are of white grit, and from the north side they are surmounted for ten miles by a veritable sea of steep spinifex-covered sandhills. These abut against and surround a remnant of tableland, which has by sub-aerial influences been cut up into narrow sections of grotesque shape and singular aspect. One of them, which Stuart names Chambers' Pillar, stands on a pedestal of conical outline, composed of thin layers of friable greenish-white sandstone. The pillar is more argillaceous, and the summit for about six feet in depth is stained red by iron, and judging by fragments which are found below, is superficially glazed.

The two points on the pillar, which in Stuart's description are prominent objects, have in the course of 30 years been weathered to nearly the one level, wherein also the protective influence of the capping portion is attested by the dimensions of the pillar at the summit exceeding its middle girth. Around the north view the broken and detached hills are weathered into castellated shapes.

Hitherto no section has disclosed what underlies the blue clay bed, but at 14 miles north of the pillar the second division of country begins at Mount Charlotte ridge, the most southerly of the terraced formation.

II. The Terraces.

The Mount Charlotte ridge (fig. 5) consists of a purple fissile sandstone which rises about 200 feet above the sandy tract, which separates it from the Pillar and its neighbours fourteen miles to the south. The dip of the series being south at only 20 deg., but very precipitous on the north side and bare of vegetation; a good natural section is displayed about two miles east of the track. At the foot of the escarpment, the sandstone is underlain by a bed of argillaceous limestone arranged in mammillary concretions, the concretionary layers having manganese-dendrites between them, and what might be termed the nucleus of the concretion is singularly like the cast of a shallow shell.

Beneath this band is another close-grained argillaceous limestone, which leaves an insoluble residuum of quite one-third when treated with hydrochloric acid. Portions of this band have a minute oolitic structure so suggestive of foraminifera that it was only after Mr. W. Howchin, F.G.S., had made a microscopic section that it was settled they were not organic. Next following underneath is a thick stratum of calcareous sandy or earthy nature, very fissile and soft, and containing an immense number of thin veins of manganese and manganic ironstone. From this stratum, which weathers easily, the numerous nodules of manganese and ironstone, which covers large areas, is derived.

The lowest bed of all is a siliceous limestone, which weathers into a corrugated face like a very coarse file, and by its weathering exposes angular fragments imbedded in it, which are undistinguishable from the porcelain cap of the table-land.

This series, which in gentle undulations forms the terraces and parallel ridges, intervenes the whole distance to the foot of the Macdonnells. At Mount Burrell Station, a few miles further north, is the Whinham Springs of Stuart. The springs are due to an anticlinal fold which here crosses the Hugh. Just below the springs, the limestone exposed in the cliff dips south at 45 deg.; and immediately northward and continuing for many miles, the dip is north at a very low angle. This brings the different beds in view as an ascending series so far as the James Range, where a synclinal trough is well marked, and a well 190 feet deep pierced the fissile sandstone (which is here of white colour) and struck good water. North-west of Mount Burrell, the porcelain capping is seen on the eminences, but the aspect is not so prominent as on the grits of the table-land. It is evident, however, that the porcelainising action extended over the whole surface of the country, but of this more hereafter.

In the Waterhouse Range, a very clear synclinal trough is

seen in the banks of the Hugh between Owen Springs Station and the Undertree Well.

The sandy covering of the plains between the ranges conceals the rock formation below, and the flat-topped hills which occur in some portions of them were away from the track and therefore I was unable, through the exigencies of travel, to do more than surmise their probable structure.

III. The Central Plateau.

Seen first from the Waterhouse Range at Orraminna Pass, thirty miles away, the aspect of the Macdonnell Range forming the south edge of the plateau is anything but imposing. The narrow gaps in the range show no sign of other ridges beyond, and this one ridge can be plainly discerned by its overhanging scarped edge facing the north, and its foot sloping into the plain, to be an immense layer of rock which has been tilted up on edge.

This ridge is composed of an intensely hard red quartzite in layers of about six inches thick, but the layers have little or no cross jointing. It strikes nearly east and west, and rests directly on a very felspathic mica schist in which are bands of granite of coarse texture. Above the quartzite is a thick stratum of limestone, very impure and variable in composition. It may be best described as an immense number of thin bands of argillaceous and siliceous limestones with partings of argillaceous sandy matter often intermixed with seams of brown ironstone, and the whole mass pervaded by manganese dendrites.

At the gaps, which are about two chains wide, the different creeks which rise further to the north flow out on to the plain, and during rains form an extensive area of flooded ground, which is eventually drained by the Todd Creek. The gaps, commencing with the western one through which the telegraph line passes, are Temple Bar, Heavitree, Emily, Jessie, and the Slip-panel—the latter, as its name suggests, being so narrow as to be closed to cattle by a panel or so of fencing. Where the gaps open on to the plain the limestone is worn back for some considerable distance on either side, and the plain is strewn with stones of quartzite, porcelain and chalcedony. Between the gaps, however, the limestone foots the quartzite in the form of black-looking knolls, whose colour is due on its weathered faces to a superficial coating of manganese. The knolls of limestone reach, perhaps, 100 feet up the slope of the quartzite, and are covered with mulga. Above this the quartzite stands up three, four, and 500 feet red and naked, except where here and there a cycad maintains a footing among narrow crevices in the rocks. The summit is a narrow ridge, and the north side is a sheer precipice or steep escarpment caused by the breaking away of the undermined rock

to about half the depth of the side, and there the schists buttress it up, having their own slope covered with a talus formed of the fallen quartzite rocks. Standing on the ridge, the quartzite can be traced for miles to the limit of vision on either side. Varying little in apparent height, sometimes straight, sometimes sinuous, this thin red line holds its own in a general direction of east and west. Distinctly visible from this elevated position, the mass of upland country collectively termed the Macdonnells are seen to be composed of other ridges, all parallel and narrow, and inclined like the first. The rock tints and scarped edges leave no room for doubt as to their identical composition, and that they are situated along the edges of a line of faults which bring the same series and sequence of rock beds into view. Looking northward the country rises, and the quartzite ridges are but little elevated above the plain which extends to the Reynolds Range. Passing through Heavitree Gap, and following the telegraph line, Alice Springs is situated on a boss of coarse red granite, which has greatly disturbed the country. To the north ridge, beyond Bond Springs cattle-station, we pass over numerous intrusive dykes of diorite, which have faulted the granite and schists. Plates of mica two and three inches square occur in the granite. A descent of only 40 feet from the north ridge leads down to the tertiary alluvial covering of the plain. The system of diorite dykes, which are met with north-east of Alice Springs, do not continue beyond the Mount Benstead ridge, the last one being met with at Mount Benstead well, where the dyke, by forming a bar across Love's Creek, dams back the soakage waters, and affords a limited supply to the well.

East of Alice Springs. the Macdonnells are formed of two nearly parallel ridges, the Undoolya and Benstead, which dip south and strike nearly east and west. The Hart Ranges, with which they converge and junction, have also two main ridges, the Georgina or Bald Hill ridge and the Hart Range proper. This system runs E.S.E., and dips northerly. Love's Creek and the Ross drain the first two ridges, and the Hale or Elder the two latter. From the chaotic jumble of mountains which are caused at the junction of the Benstead and Georgina Ranges, a range which I have called the Elder Range runs south-eastward, and has been traced by me to lat. 24° S. A section drawn through the system from the Ross Creek across through the ruby-fields to the Plenty River shows a great anticlinal axis, with four main faults indicated by the four ridges mentioned. At the Ross, the limestone series is surmounted by a fissile purple sandstone, apparently identical with that found on the Mount Charlotte ridge. It forms a ridge with a steep escarpment on the north side, and with the limestones ascending about half-way up. Proceeding up the

gorge, a section of an anticlinal fold is clearly shown, the first stratum being near the edge of a fault in the limestone which runs near the foot of the escarpment just mentioned, and along which the Love joins with the Ross.

North of the fault or at the mouth of the gorge, the stratum is a white gritty sandstone similar to that of the tableland hills, and is capped with a red glazing. Portions of the glazed section have fallen to the foot in huge masses, and have rounded by weathering into shapes suggestive of the appellation of turtle-backs. Following this comes the fissile sandstone, weathered red, and then the limestone series, the different bandings of which are displayed in the cliffs in zigzag contortions of striking aspect. In this series is the "Bitter Spring," the water of which tastes like quinine, it has no ill effect on man, and the camels drink it as though they would never be satisfied. The length of the gorge now lies altogether in this series, except at the extreme north end, where the crown of the anticline is distinctly shown, and then the fissile sandstone, surmounted by the argillaceous glazed-grit, again appears The white grit, with its porcelain capping, is termed the "Made Hills" by the diggers, which are well-known landmarks.

Beyond the "Made Hills" a fault brings up the schists and granites again, and diorite dykes, running E.S.E. through it, are numerous. The creek now occupies the end of an elevated valley-plain about twelve miles long and four wide, whose sides are composed of quartzite ridges, the south one dipping southward and the north one—the Georgina Range—dipping northward. The plain is therefore along the crest of the anticline, and has been formed by the degradation of the schists, which are now covered by a Tertiary alluvium. There is one patch of limestone lying flat on it in thin layers, but I am uncertain as to its relationship. Eastwards the plain contracts to about a mile in width, and then granitic dykes of small dimensions, and numerous thin leaders of quartz rock are found in micaceous schist and hornblendic schists, with diorite dykes on the northern edge. The quartz veins carry small spots of galena, argentiferous grey copper ore, brown iron-stone, and free gold in cavities, evidently marking the site of decomposed pyrites. This is the Paddy's Hole Goldfield, and receives its name from a rock waterhole in the southern quartzite ridge. Passing over the anticline through a broad faulted portion of the Georgina Ridge, another system of auriferous quartz veins in the neighbourhood of diorite dykes is crossed in the descent to the Hale or Elder River. Beyond the broad valley of this watercourse, which has large gum trees growing in its sandy bed, the Hart Range rises, and is about 16 miles across, and consists of the same series of beds as the other range, but which, though greatly faulted, are more easily inclined, especially at the

junction of the Florence and Maud Rivers, where the limestone beds appear flat, and have been weathered into such peculiar shapes that they have been termed the Castle Hills. The upturned schists throughout this area are thickly pierced with diorite dykes and converted into a coarse granular crystalline rock composed of large crystals of white felspar and brown mica. In the vicinity of the diorite it is studded with garnets, and has frequently been alluded to as garnet-sandstone. In the shingle of the creeks, which flow down through this series, the waterworn garnets are plentiful and having a hardness above the typical garnet, and of fair colour, have been collected and put into the market as "Australian rubies." On the north side of the range, or at head of Florence River, the quartzite ridge dips northward, with limestone knolls at its foot, and the steep escarpment of Mount Mabelle beyond reveals the fissile sandstone which rests on it, and dips away into the great plain beyond, where flat-topped hills and plains are strewn with ironstone nodules and chalcedony pebbles. The laminar schist forming the core of the plateau and ridges is frequently of peculiar appearance, due to the size and predominance of its felspar crystals. They are visible when standing a considerable distance back, and are similar to what has been aptly termed "swellings and eyes" by German geologists.

On the north end of the Elder Range, dividing the Lizzie from the Illogwa, the schistose structure is horizontally disposed, and the formation has been weathered into cheese-ring cones, to which the "swellings and eyes" impart a peculiarly grotesque appearance..

In the valley of the Illogwa is the dyke from which are procured the large plates of mica recently brought down to market; tourmaline and beryl accompany it. Eastward the country is unexplored, save for Winnecke's track, near the Queensland boundary.

The Elder Range is joined at Glen Annie by the two ridges which come past the Paddy's Hole Goldfield, and Glen Annie is the gorge through the anticline by which the Hale or Elder escapes from the valley south of the Hart Range.

Eight miles lower down the Undoolya ridge joins, and there are one or two subsidiary quartzite ridges below; and then the river, as far down as I explored it, to lat. 24° 7′, passes through the formation of the terraces, as met with along the Orraminna route and the channel of the Hugh.

Conclusion.

It is evident that the triangular portion of the plateau just described has been the scene of deep-seated uplifting forces at a

period subsequent to the deposition of the terraced formation, and that a sectional line from the Lake Eyre basin to the top of the plateau is through a regular sequence of formations in descending order, with only the one interruption caused by the exposure of schist and granite on the Finke at Polly's Springs. That this schist-ridge was upheaved long antecedent to the deposition of the strata now surrounding it is certain, otherwise the beds would have been tilted and the terraced formation of calcareous strata brought to the surface. It is probably an outlying extension of the rocks forming the base of the Musgrave Ranges. The synclinal undulations of the terraces becoming more and more sharply curved in approaching the Macdonnells, and finally becoming faulted and dislocated along with the rocks forming those ranges, is proof that their folding is due to the upheaving of that mass, and therefore that this portion of the plateau has been upheaved since the deposition of the terraced formation. From Dalhousie Springs to the Everard Plain on the top of the plateau is 300 miles in a straight line, and from Lake Eyre the distance to the same point is 500 miles. By the beds of the watercourses which drain its surface, this section is one continued gentle slope passing from sea level up to 2,700 feet, and so uniform is it that there is not a waterfall, or even a rapid, throughout the whole extent of the main creek channels. With regard to the geological age of this region the presence of fossils on the face of the slope up to an altitude of 800 feet places us on pretty sure ground and shows the age of deposition to be Mesozoic (and probably Cretaceous). Farther up the slope there must exist doubt until fossils are actually discovered, though it is a reasonable presumption that the beds throughout belong to one great series. With regard to the Macdonnells and the plateau the conformability of the rocks is certain, but should their age be considered archæan solely on the ground of their high degree of metamorphism? The diorite eruptions have evidently been the chief cause of metamorphism, and to their general strike or direction the whole northern side of the plateau conforms.

Further, did this intrusion of diorite take place late in the Mesozoic period, and uplift Central Australia into dry land. In such a case the great and gently sloping swell would eventually be cut up by surface waters and wind. The continental climate thus engendered being similar to that now existing would seldom cause floods to deepen the watercourses, and we might rather expect short creeks which soon spread out over the surface and their waters thus completely evaporate, leaving behind the matters previously held in solution. The finest particles would be carried furthest by the running waters, and two classes of

deposit would be caused. The lower beds would consist of the finer clays and sediments, and the upper beds nearest the streams source be the coarser and more sandy. Waters containing lime in solution deposit it readily when relieved of pressure, and also its iron when flowing among materials which furnish carbonic acid. But silica which is held in solution by water is only precipitated on complete evaporation, and therefore a country which receives such waters must eventually be covered with a floor of chalcedony, or if previously a sandy formation, the upper surface must be changed to a porcelainised sandstone. Eventually drainage along a few main lines or channels would be determined, and creeks formed such as we now know. Their channels would be continually widening and undercutting the porcelain covering, which, breaking off for want of support, ever presents a new face to wear, until at length the whole would be removed, or a few symmetrically shaped conical hills with their porcelain cappings be left standing about the plain in all directions.

Is not this the condition of Central Australia to-day—the flat-topped hills with porcelain caps giving way to coarser-grained grits with only glazed surfaces, and intermixed with calcareous and ferruginous matter, as we approach the head of the present drainage system? And are not the metamorphic rocks at this source composed almost entirely of bisilicates, which waters charged with alkaline bicarbonates will rapidly attack and waste, thus furnishing the material for the phenomena stated? By such reasoning one is tempted to regard the red quartzite as no other than the bottom of the sea which washed still older rocks forming the heart of the plateau to the northward, and which plateau, by the uplifting of its southern seaboard, has been extended down to the Macdonnell Ranges. The appearance of dry land in Central Australia during secondary times must have an interesting bearing on other features of Australia too great to discuss now. One point may, however, be referred to, and that is the elevation which the south shore of Australia is still undergoing, as evidenced by the cliffs of the Great Bight and other phenomena visible along our littoral.

The description which Maw and Washington has given of the Atlas Mountains and plains of Morocco are wonderfully like the regions dealt with in this paper. Chalcedony-capped flat-topped hills dot the plain, and igneous rocks raise Cretaceous strata to heights of 5,000 feet; while French geologists have on the eastern end seen Jurassic strata still higher, and pierced with diorite rocks.

One subject which is of great interest to geologists is the occurrence of obsidian bombs scattered throughout the whole

Plate III

FIG. 1.

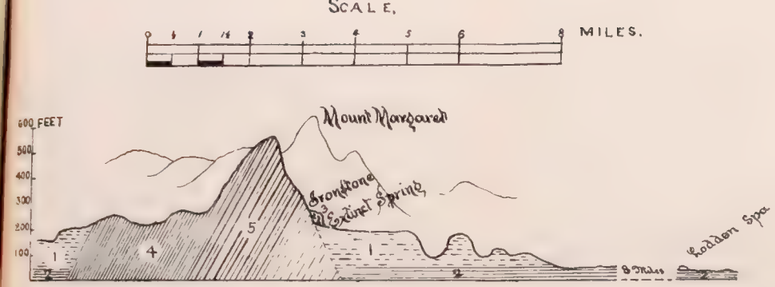


FIG. 2.

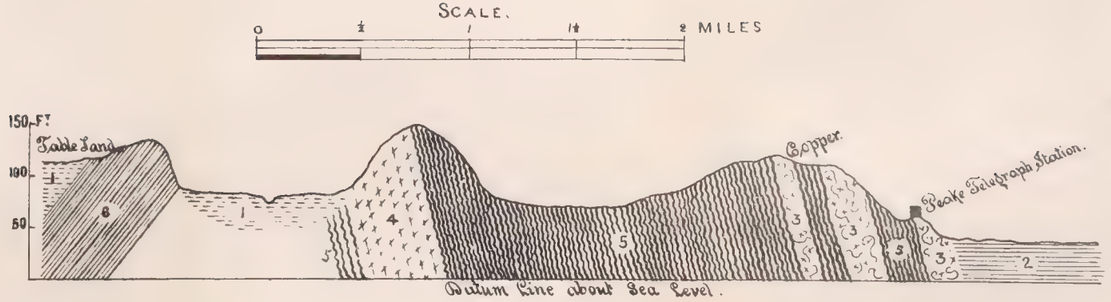


FIG. 3.

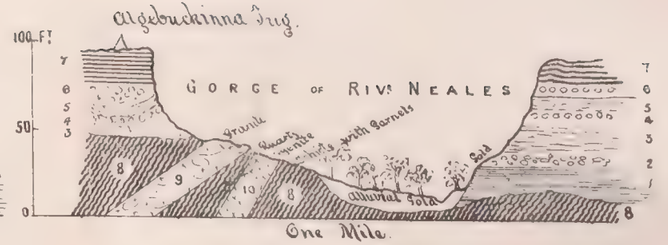


FIG. 4

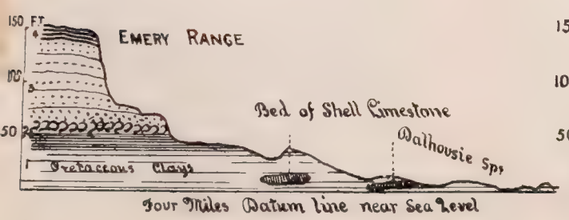
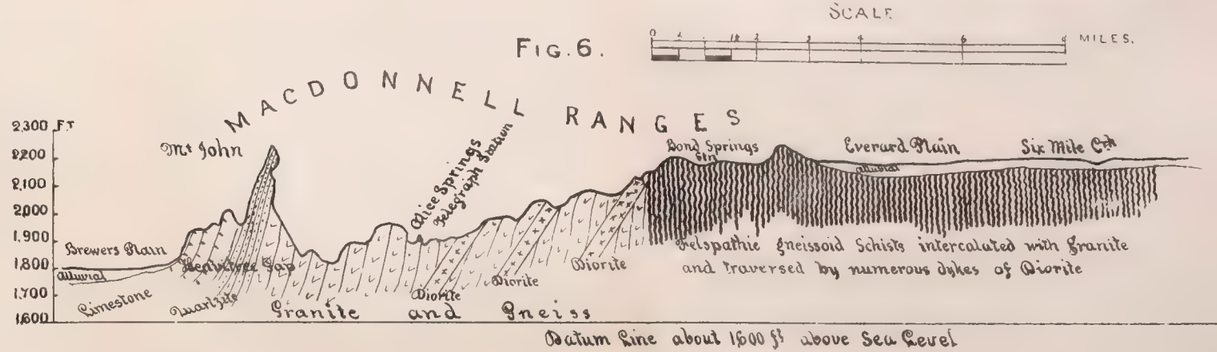


FIG. 5.

FIG. 6.



region. I have one from the Everard Plain, but they are most numerous among the portions of the plain whose surface is strewn with chalcedony and ironstone nodules. I found none *in situ*, but in the Peake Range, and afterwards in the Macdonnells, I picked up in the creek-debris fragments of what is apparently sanidine felspar, but of which the parent rock was not seen.

EXPLANATIONS TO PLATE.

FIG. 1.—SECTION ACROSS SOUTHERN END OF THE DENISON RANGE.

1. Table land sandstone (Tertiary).
2. Blue clay and gypsum (Cretaceous).
3. Ironstone mass.
4. Argillaceous and talcose slates } Primary.
5. Quartzite bands in argillaceous and hydro-mica slates }

FIG. 2.—SECTION ACROSS MIDDLE PORTION OF DENISON RANGE.

1. Table land sandstone (Tertiary).
2. Blue clays and Gypsum (Cretaceous),
3. Granite.
4. Syenite.
5. Argillaceous and hornblendic schists.
6. Quartzite bands and talcose slates.

FIG. 3.—ALGEBUCKINNA GOLD FIELD, R. NEALES.

1. Sandy kaolin
2. Gravel cement (auriferous)
3. Sandy cement
4. Gravel cement } Tertiary.
5. Sandy cement
6. Gravel cement
7. Compact sandstone
8. Argillaceous and Hornblendic Schists with Garnets and Copper.
9. Granite dyke.
10. Quartz-syenite dyke.

FIG. 4.—TYPICAL ESCARPMENT OF TABLE LAND.

1. Cretaceous clays with beds of shell limestone and gypsum.
2. Bed of nodular ironstone.
3. White sandy grits often argillaceous.
4. Porcelainised sandstone.

FIG. 5.—SECTION ACROSS MT. CHARLOTTE RANGE, 12 MILES NORTH OF CHAMBERS PILLAR.

1. Sandy thin beds of shale with manganic ironstone.
2. Siliceous limestone.
3. Calcareous earthy beds with seams of manganic ironstone.
4. Argillaceous limestones of oolitic structure.
5. Fissile sandstones.

FIG. 6.—SECTION ACROSS MACDONNELL RANGES TO GREAT PLATEAU.

Gums, and a Resin, produced by Australian Proteaceæ.

By J. H. Maiden, F.L.S., F.C.S., &c., Curator of the Technological Museum, Sydney.

(Communicated by Professor Rennie, M.A., D.Sc.)

[Read September 10, 1889.]

It is only of late years that the presence of gum in the Proteaceæ has been recorded. It has not even yet, the author believes, been noted as having been found on non-Australian species. In reproducing Deputy-Surgeon-General Shortt's statement as to the gum of *Grevillea robusta (infra)* the *Gardeners' Chronicle* excusably said (1882)—"The statement is a remarkable one, as none of the Proteaceæ were known to yield gum." The first record I can find of a Proteaceous gum is in Captain Lort Stokes' "Discoveries in Australia," ii., 132. The work was published in 1846, and he records gum from a Western Australian *Hakea*, termed "Holly" by the colonists and "Tool-gan" by the blacks. The second is a statement in the Catalogue of Western Australian Products at the Intercolonial Exhibition, Melbourne, 1866—"Gums of *Hakea* species are found *plentifully* (my italics) after the autumn rains." The next is by Dr. Cooke, who describes (1874) a sample of *Grevillea robusta* gum in the India Museum. This endemic Australian species is a common avenue-tree in Southern India and Ceylon. Then follow Surgeon-General Shortt's observations in South India in 1879-81 on gum of the same species. Still the same species yielded gum for Fleury's experiments in 1885, and the author now follows with records of the gum of five additional Proteads and the resin of a sixth.

These Proteaceous gums are not only of much botanical interest, but of high chemical importance. The present is the second occasion on which the presence of Pararabin has been recorded in any gum, so far as the author is aware. The first announcement of it having been found in gums is that of its discovery in *Sterculia* ("Kurrajong") gum by the author, and recorded in a paper in the *Pharmaceutical Journal* of London, vol. xix.) Pararabin had only been previously recorded from beetroot and carrots and from certain seaweeds. Pararabin differs from Metarabin in its solubility in dilute *acids*.

GREVILLEA ROBUSTA, *A. Cunn.*

"Silky Oak." Found in New South Wales and Queensland.

"In the India Museum is a sample of gum rather like that of *Moringa*, of a vinous-red colour, and but little soluble. It is said to have been obtained from this tree, which is cultivated to a limited extent in Mysore. It has a bright shining resinoid fracture, which it retains. It is much mixed with pieces of friable bark, to which it adheres. The gum is only botanically interesting" (Cooke, "Gums and Resins of India").

In some notes on the Shevaroy Hills for 1881, by Deputy-Surgeon-General Shortt, the following passage occurs:—"Of the plants introduced in these hills, I have to notice a peculiarity as regards *Grevillea robusta*. One tree, which is now eleven years old, has for the last two years during the rains produced spontaneously each year about ten ounces of a translucent gum, which has no smell or particular taste, is of a pale yellow colour, and mixes readily with water, when it forms a whitish-brown coloured mucilage, and as a paste answers all the purposes of the so-called gum arabic for adhesive purposes. The other Grevillea trees are some two or three years younger, and have not as yet evinced any disposition to produce gum." This finding of a gum so adhesive in the Proteaceæ is not borne out by the author's experiments.

Fleury experimented upon gum of this species from Algeria (*Journ. Pharm.* [5], ix., 479-480; *Journ. Chem. Soc.*, xlviii., 238). He speaks of it occurring "frequently," and being similar in appearance to cherry gum. It is yellowish-red, slightly translucent, and slightly friable. In water it swells a little, and slowly produces a very persistent white emulsion, which passes through all filters. It contains no starch, but gives 3 per cent. of ash, principally calcium carbonate and a little potash. The emulsion, treated with absolute alcohol, gives a copious precipitate of gum proper. When the alcoholic solution is evaporated it gives 5·6 per cent. of a reddish transparent resin, with slightly acid properties; this is soluble in alkalies and carbon bisulphide.

Common as this species is in this its native country of Australia, it has not yet been my good fortune to find any gum on it M. Fleury's specimen is almost a gum-resin; exudations from a *Hakea* and a *Xylomelum* examined by me yield true gums, with not a trace of resin. But *Grevillea striata* yields an exudation which is mainly resin, so we must come to the conclusion that the Proteaceæ yield both gums and resins.

GREVILLEA STRIATA, *R. Br.*, B. Fl., v. 462.

"Beef-wood." Found in South Australia, New South Wales, Queensland, and Northern Australia.

This particular sample came from Whittabranah, Wilcannia, N.S.W. It weighs several pounds, and was obtained in large pieces from two average trees, without using a ladder. Out of reach there was about an equal quantity to be seen, and which was left on the trees; a large quantity was also found lying on the ground, partially decomposed. It was so hard on the trees that a hammer and chisel were necessary to remove it.

It is quite free from odour, and has a dark reddish colour. When pure it has a bright fracture, but much of it is mixed with woody matter in a fine state of division. The warmth of the hand is sufficient to cause the resin to adhere to it. It sticks to the teeth, but is without taste. It is reduced to powder with the utmost facility, forming a dull powder. It is rather opaque looking.

In cold water the substance whitens slightly. If the water be boiled, the liquid becomes very turbid, reminding one of coffee with excess of milk and with abundant "grounds." No odour is developed.

Petroleum spirit extracts 5·2 per cent. of a hard, transparent, brownish resin.

The residue is acted upon by alcohol, which extracts 60·1 per cent. of a brownish resin.

This residue is then digested in water, which extracts 5·6 per cent. of a yellowish substance, consisting chiefly of arabin. The residue consists of 26·5 per cent. of a brownish substance which swells enormously in water, and which consists of metarabin (14 per cent.), while the remainder is accidental impurity.

Summary.—Resin soluble in petroleum spirit ...	5·2
" " alcohol	60·1
Soluble in water (arabin)	5·6
Metarabin	14·0
Accidental impurity	12·5
Moisture	1·7

The presence of metarabin in this exudation is remarkable, in view of the fact that pararabin is the main constituent of gums of this Natural Order. I have subjected my experiments to very careful repetition and revision. It contains no tannic acid.

The present is the first occasion in which a resin (or, to speak more correctly, a substance consisting mainly of resin) has been recorded from any Protead, so far as the author is aware, and certainly from any Australian species.

Hakea acicularis, *R. Br.*

The "plentiful" occurrence of *Hakea* gum in Western Australia has already been alluded to. In Southern New South

Wales a clear, hard, yellowish gum has been observed (May, 1888) on a shrub (*Hakea acicularis*, R. Br., B. Fl., v., 514) in small quantities.

Since the above was written Mr. R. T. Baker has been fortunate enough to discover gum on a twig of this species near the South Head Lighthouse, at Sydney. The leaves were dead, and matted together by the gum, which is most plentiful near where the wood has been destroyed by an insect. The whole branch as received at once gives the idea that the gum is a pathological product. On healthy branches of the same shrub no trace of gum could be seen. It is perfectly transparent, and of a pale amber colour, much resembling (in outward appearance) ordinary Black Wattle gum (*Acacia decurrens*). It is insipid, and when placed in water forms a smooth mucilaginous liquid, having much the consistency of tragacanth under similar circumstances (though without opalescence), and, like it, exceedingly difficult to filter. Following is an analysis :—

Soluble gum (arabin) ...	16·52
Pararabin	63·2
Moisture	19·1
Ash	1·6

Hakea Macraeana, *F. v. M.*

Found in Southern New South Wales. A recently discovered species. Height, 20 to 30 feet ; diameter, 4 to 14 inches. Sugar Loaf Mountain, Braidwood.

An almost colourless tasteless gum. Months after collection it is tasteless, like indiarubber, showing its retentiveness of moisture. It swells up in cold water to a great bulk, forming a gelatinous mass very similar to that yielded by Tragacanth under similar circumstances. It however retains the shape of the original pieces for a much longer period than does the latter substance. It seems scarcely to dissolve. Following is an analysis :—

Arabin	5·8
Pararabin	69·94
Moisture	22·7
Ash	1·32

A second sample has been received from Bembooka Mountain, Lyttleton, New South Wales It is a much finer specimen than the preceding, and I am able to make a more definite statement concerning it. It is from an aged tree, which has commenced to decay in the centre. It consists of large tears up to two inches long, and one inch broad, and attached to each of these large ones are a number of vermiform tears of two or three lines in

diameter. It is transparent, of hyaline or horny appearance, and from colourless up to pale amber. It reminds one irresistibly of Sterculia gum, and it is not a little interesting to find that the similarity also extends to their chemical composition. Following is an analysis :—

Arabin...	...	...	15·02
Pararabin	...	...	63·4
Moisture	...	...	21·0
Ash ...	...	...	1·4

A comparatively high percentage of arabin in a Proteaceous gum is a sign of its newness, and causes the formation of a viscid solution in water. When these gums have been exposed to the weather, more or less of the arabin is washed out, and the remaining soluble portion can be filtered off with great facility.

Persoonia linearis, *Andr.*, B. Fl., v. 397.

"Geebung." A very dark gum has been observed (12th June, 1888) on this species. It seemed to resemble that of *Grevillea striata*, but was not sufficiently abundant to collect.

Stenocarpus salignus, *R. Br.*, B. Fl., v. 539.

"Beef-wood," "Silky Oak," &c. Small quantities of gum have been seen on bruised trees of this species several times. The author looks upon gum as being usually a pathological product, and it is therefore most likely to be found on sickly and injured trees.

Xylomelum pyriforme, *Knight*, B. Fl., v. 408.

This is the well-known "Native Pear" of New South Wales. I am not aware that the finding of gum on this tree has been previously announced.

I found a small quantity of a yellowish-brown gum, tough, and of dull appearance, on a sapling which was six inches in diameter, but which had been cut down, leaving four feet of stump, from which there was a free growth of new leaves—a testimony also that the gum had exuded some time.

It swells up largely in cold water, and then disintegrates, forming masses of a nearly colourless jelly. I have analysed it with the following result :—

Arabin...	...	...	trace
Pararabin	...	...	79·56
Moisture	...	...	17·35
Ash ...	...	...	·55

It may, therefore, be considered to consist solely of pararabin.

Addendum.—The remarks made under *Persoonia linearis* may now be repeated, word for word, in regard to a Sydney "Honeysuckle" (*Banksia serrata*, Linn. fil). Can it be that this phenomenally wet season is the cause of the present abundance of gum on species already known to yield it, and on certain species (not confined to the Proteaceæ) on which it had not hitherto been recorded.

Notes on Certain "Pores" on the Veins of some Diptera.

By Frazer S. Crawford.

[Read Sept. 10, 1889.]

Plate IV.

There has lately been a controversy between two eminent dipterists, Dr. Williston, of the United States, and Mr. F. A. A. Skuse, of Sydney, whether the parasites of *Icerya Purchasi* and *Monophlebus Crawfordi* are identical; the affirmative view being originally promulgated by myself.

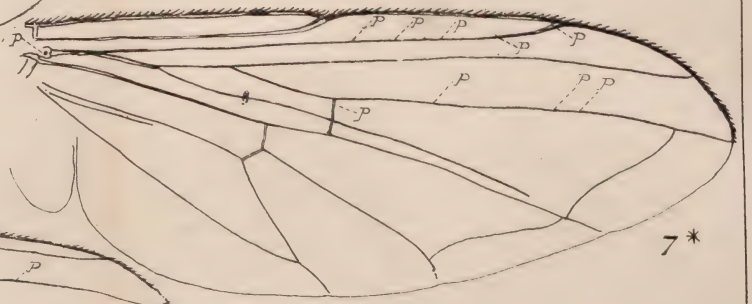
Dr. Williston had to base his opinion on specimens more or less mutilated, and without any certain knowledge of the host from which each was bred, whereas Mr. Skuse was enabled to breed the insects, and therefore to examine them to the best advantage.

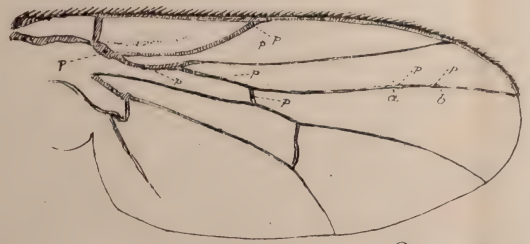
Having lately had an opportunity of thoroughly re-examining the venation of the wings of these insects, I discovered that my original determination was incorrect; and I take this opportunity of corroborating Mr. Skuse's opinion that the insects are specifically distinct.

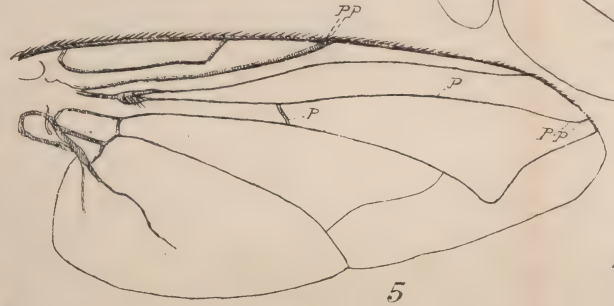
In the course of this investigation I discovered on certain veins peculiar processes, which I call "pores." These are very small bodies, circular in shape, hardly raised above the level of the vein, and apparently having an opening in the centre, but of this fact I do not feel at all sure. They are generally on the upper surface of the wing, are slightly darker in colour than the vein, and so small as to require a half inch objective to detect them. So far as my observations extend, they number from five to eight when present, and their number and position are constant in each species, and occasionally they are accompanied with a slight dilation of the vein at the spot where they appear (plate iv., fig. 2*a*).

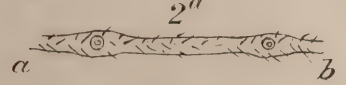
Now on the last section of the third longitudinal vein of *Lestophonus Iceryæ*, Will., there are three of these pores (plate iv., fig. 1), but on the same part of *L. monophlebi*, Skuse, there are but two (figs. 2 and 2*a*). From the knowledge gained by examining other diptera, I feel confident that this apparently trifling difference is in reality a specific distinction of great importance.

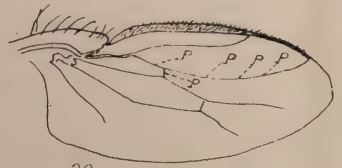
Mr. Skuse has obligingly informed me that these "pores" are, he believes, homologous with what Jurine (Nouvelle methode du

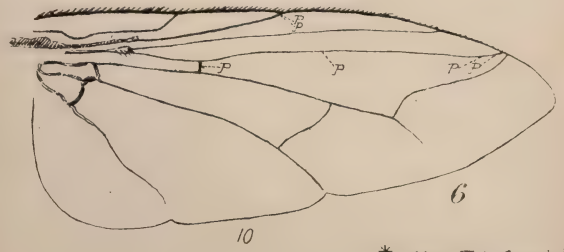












F.S.C. del. ad nat.

* Note. This fly with 10 pores was not examined until after the text was printed. F.S.C.

SURVEYOR GENERAL'S OFFICE, ADELAIDE. Frazer S. Crawford, Photo-lithographer.

classer les Hyménoptères et les Diptères : 1807) named "Bullæ," observed by him in the wings of certain hymenopterous insects. It is strange that for eighty years these "Bullæ" or "Pores" have been either ignored or forgotten by succeeding dipterists. Not having M. Jurine's work to refer to, I cannot state what are his views with regard to these "Bullæ," but judging from the name bestowed (bulla, a boss or stud), he did not think they were of the nature of pores. On the other hand Mr. Skuse suggests that they are for the purpose of aerating the blood coursing through the veins. If this be their object the term "pore" is correct. Considering that some of the families of the the Diptera do not have them, that their position is limited to certain veins, viz., the junction of the first longitudinal with the costal, the third longitudinal, and the middle transverse vein ; and that in some places the pores are close together, whilst elsewhere they are relatively far apart, it really seems that if such be their object, nature was extremely capricious in arranging them and that she had neglected in this case that close adaptation of means to an end that characterises her work.

So far as my observations have extended, it would appear that the Diptera possessing large scales or hairs on their veins (*Culicidæ*, *Psychodidæ*, *Tipulidæ*) have no pores ; while the *Muscidæ*, *Syrphidæ*, and *Dolichopodidæ* have them. With one exception, a *Dolichopodida*, there is always a solitary pore on the middle transverse vein, and in this case the third longitudinal is so enlarged at this spot that the pore would otherwise be situated on the mid-transverse vein (fig. 8). My observations have not as yet extended to the Hymenoptera, but judging from Mr. Skuse's remark, only certain families possess them, as in the case of the Diptera.

Now that the attention of dipterists is called to these facts it is to be hoped that before long their true nature may be satisfactorily settled, and that they may sometimes be found of value in settling doubtful cases of affinity.

EXPLANATION OF PLATE IV.

Wings of the following Families, Genera or Species of the Diptera, showing the position of the pores.

Family Oscinidæ ? 1. Lestophonus Iceryæ. 2. L. monophlebi. 2*a*. Portion of the 3rd longitudinal vein showing dilation with pores. 2*b*. A pore very greatly magnified. 3. Sp. ?

Family Muscidæ. 4. Musca domestica. 5. Calliphora sp.

Family Tachinidæ. 6. Tachina ? sp.

Family Syrphidæ. 7. Sp.

Family Dolichopodidæ. 8. Sp. 8*a*. A portion of mid-transverse vein, being greatly enlarged.

A Revision of the Flora of Kangaroo Island and other Botanical Notes Relating thereto.

By Professor Ralph Tate, F.L.S., F.G.S., &c.

[Read December 4, 1888.]

In a "List of Plants additional to the Flora of Kangaroo Island" (Trans. Roy. Soc., S. Aust., for 1888, p. 290) are certain species recorded the correct identification of which I was disposed to challenge, and for this purpose the author of the list kindly submitted for my examination the majority of the species which formed the basis of that enumeration. After very careful study, so far as the condition of the specimens would allow, I offer the following corrections:—

Rhagodia parabolica is *Chenopodium glaucum.*
Pultenæa villifera is **P. canaliculata.*
Pultenæa prostrata is **P. involucrata.*
Acacia acinacea is *A. brachybotrya.*
Acacia brevifolia is *A. longifolia.*
Leptospermum erubescens is *L. lævigatum.*
Melaleuca ericifolia is *M. parviflora.*
Cryptandra amara is *C. hispidula.*
Spyridium pomaderroides, *Spyridium coactilifolium* } are *Cryptandra obovata.*
Spyridium bifidum is **Cryptandra scabrida.*
Opercularia ovata is *O. varia.*
Vallisneria sp. is *Ruppia maritima.*
Blyxa Roxburghi is a confervoid.
Hydrilla verticillata is **Myriophyllum Muelleri.*
Aristida Behriana is *Ehrharta stipoides.*

Cassytha sp. is a variety of *C. pubescens* with warty stems, but is readily connected with the more common form on the mainland, having a smooth stem.

Tetratheca sp. is *T. ericifolia*, of which two varieties occur on Kangaroo Island—*a. var. aphylla*, which has rough leafless stems branching from the base, and large five-merous flowers; *b. var. pilosa*, which has very short, hispid, narrow-lanceolate leaves and smaller four-merous flowers.

* Species now recorded for the first time.

Calycothrix sp. is not distinct from *C. tetragona*, except by its smaller pubescent leaves.

Hakea marginata. The specimen is incomplete for specific identification, but probably indicates a species new for South Australia. So far as the material serves it would seem to have a nearer relationship to *H. corymbosa.*

Lepyrodia sp. may be a stunted form of *L. Muelleri*, but the specimen does not permit of generic location with any degree of certainty.

CORRIGENDA TO MY LIST (vol. VI. of these Transactions, p. 149 *et seq.*).

Pomaderris apetala. This was included in the Flora, with a doubt, by Bentham, the specimen being in leaf only. I have little doubt now that it may have been a luxuriant branchlet of *P. racemosa.*

Cassinia laevis. This proves to be conspecific with *Humea punctulata*, but the correct designation will be *Cassinia punctulata*, F. v. M. and Tate. It is recorded as *Humea cassinacea* in the Ardrossan list, and as *Cassinia alasia*, F. v. M., M.S., from Coonalpyn, Ninety-mile Desert.

Toxanthus perpusillus was inserted by inadvertence for *T. Muelleri.*

Festuca bromoides should be erased, not being indigenous.

LIST OF ADDITIONAL SPECIES, EXCLUDING THOSE IN THE FOREGOING LIST.

Boronia parviflora. DeMole River (*R.T.*).
Eriostemon difformis. DeMole River (*R.T.*).
Stackhousia flava. DeMole River (*R.T.*).
Asperula oligantha. ——? (*Tepper !*). The leaves four in a whorl, and broadly ovate.
Brachycome cuneifolia. ——? (*Tepper !*). The leaves are entire or less toothed, and the achenes sparsely hairy on the thickened wing-like margins as compared with the type.
Senecio Cunninghami. Ravine des Casoars (*Tepper !*).
Goodenia amplexans. DeMole River (*R.T.*).
Mitrasacme distylis. ——? (*Tepper*); recorded by Baron F. von Mueller, Vict. Naturalist, 2-1889.
Epacris impressa. DeMole River (*R.T.*); S.-Western River (*Tepper !*).
Sprengelia incarnata. South-Western River (*Tepper !*).
Pterostylis vittata. ——? (*Tepper !*).
Pterostylis nutans. Cape Willoughby (*Horswell*, in herb. *Tepper !*).
Schœnus discifer. Dudley Peninsula (*R.T.*).

Lycopodium laterale. Head of Western River (*Tepper !*).
Selaginella Preissiana. Murray Lagoon and Karatta (*Tepper !*).
Ophioglossum vulgatum. Karatta (*Tepper !*).

A corrected list of the Kangaroo Island Plants is given in my Revised Census of South Australian Plants.* The number of species is 513, but I anticipate considerable augmentation when the moist shaded gullies of the wetter parts of the island shall have been thoroughly explored. This prediction is formed on the fact of the similarity of the flora with that of Port Lincoln, and that several species of the latter, which extend to Encounter Bay, have not yet been found on the island.

That the flora is a rich one is testified by the number of species; but as affording some evidence of the massing together of species in a limited area, I append a list of 118 species which were collected by me in a very hurried way, and without particular search for inconspicuous species, during an afternoon ramble on October 20 of this year in the vicinity of the DeMole River on the north-west coast.

The generalizations touching the origin and constitution of the flora, which I submitted to you five years ago, have not been materially affected by the large accessions of species gained during the interval. The number of extra-Australasian species has been increased by *Ophioglossum vulgatum* and the transference of *Erythræa australis* to *E. spicata;* but it has, on the other hand, been reduced by expurgation of *Festuca bromoides*, and the substitution of *Potamogeton Tepperi* for *P. natans* and *Epilobium glabellum* for *E. tetragonum;* the proportion of such to the whole flora is now one-tenth instead of between a seventh and an eighth. The sequence of the ordinal groups as regards numbers of species remains about the same; but the ratio of genera to species is slightly altered, the genera being 256 with 513 species, representing a ratio of one to two.

The number of peculiar species is 14; *Xanthorrhœa Tatei* is now known in the Port Lincoln district and at Mount Crawford, in the Mount Lofty Range; *Cryptandra halmaturina* also occurs at Encounter Bay, as recorded by Baron F. von Mueller (Phil. Soc., Melbourne, vol. 1855, p. 121), wherein the original diagnosis will be found. They are as follows:—Cheiranthera volubilis, *Bentham;* Bertya rotundifolia, *F. v. M.;* Cryptandra Waterhousei, *F. v. M.;* C. scabrida, *Tate;* Lhotzkya glaberrima, *F. v. M.;* L. Smeatoniana, *F. v. M.;* Melaleuca cylindrica, *R. Brown;* Pultenæa viscidula, *Tate;* Hydrocotyle crassiuscula, *Tate;* H. comocarpa, *F. v. M.;* Petrophila multisecta, *F. v. M.;*

*See post.

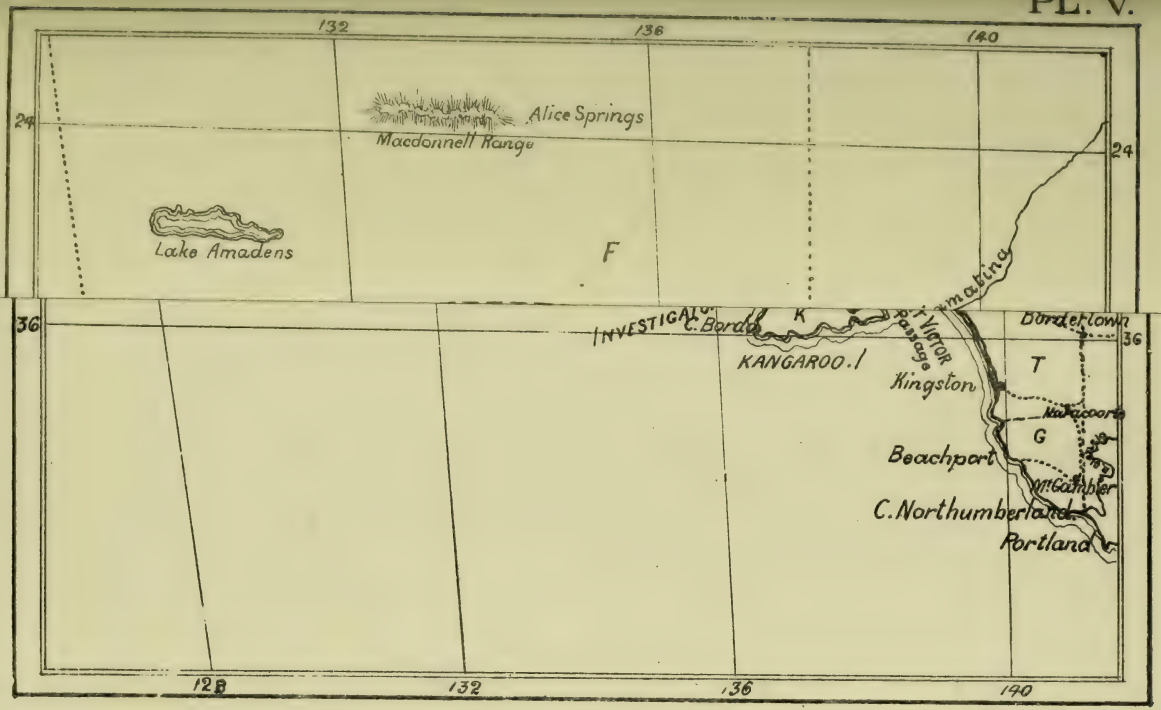
Achnophora Tatei, *F. v. M.*; Candollea Tepperiana, *F. v. M.*; Schœnus discifer, *Tate.*

List of Plants observed in the neighbourhood of DeMole River, Kangaroo Island.

Ranunculus parviflorus
Hibbertia stricta
" Billardieri
Cassytha pubescens
Viola hederacea
Drosera pygmæa
" auriculata
Comesperma calymega
Tetratheca ericifolia, vars. aphylla and pilosa
Thomasia petalocalyx
Lasiopetalum Schulzeni
Poranthera ericoides
" microphylla
Phyllanthus australis
Dodonæa viscosa
Oxalis corniculata
Zieria veronicea
Boronia parviflora
" filifolia
" Edwardsi
Eriostemon difformis
Correa speciosa
Claytonia calyptrata
Mesembrianthemum australe
Gompholobium minus
Daviesia brevifolia
Pultenæa daphnoides
" viscidula
Eutaxia empetrifolia
Dillwynia floribunda
Platylobium obtusangulum
Kennedya prostrata
Acacia retinodes
" myrtifolia (with phyllodia four to five inches long and a quarter wide)
Tillæa verticillaris
Loudonia Behrii
Haloragis teucrioides
Epilobium glabellum
Thryptomene ciliata
Baeckea diffusa
Leptospermum scoparium
Eucalyptus obliqua
" capitellata
" corynocalyx
" cosmophylla
" incrassata
Stackhousia flava
Cryptandra vexillifera
" Waterhousei
Pimelea ligustrina
" spathulata
" octophylla
" phylicoides
" flava
Petrophila multisecta
Isopogon ceratophyllus
Adenanthos terminalis
" sericeus
Conospermum patens
Grevillea aspera
" halmaturina
Hakea rostrata
Banksia marginata
" ornata
Choretrum glomeratum
Apium prostratum
Daucus brachiatus
Opercularia varia
Aster floribundus
Achnophora Tatei
Calocephalus Brownii
Ixodia achilleoides
Ixiolæna supina
Helichrysum obtusifolium var. tephroides
Gnaphalium japonicum
Stuartina Muelleri
Erechthites prenanthoides
Cymbonotus Lawsonianus
Candollea despecta
Wahlenbergia gracilis
Goodenia geniculata
" amplexans
Scævola aemula
Mitrasacme paradoxa
Logania ovata
Plantago varia
Utricularia dichotoma
Myosotis australis
Prostanthera spinosa
Styphelia Sonderi
" concurva
" fasciculiflora
Epacris impressa
Casuarina quadrivalvis
" distyla
Thelymitra flexuosa
Caladenia carnea
Patersonia glauca
Sisyrinchium cyaneum
Bulbine semibarbata

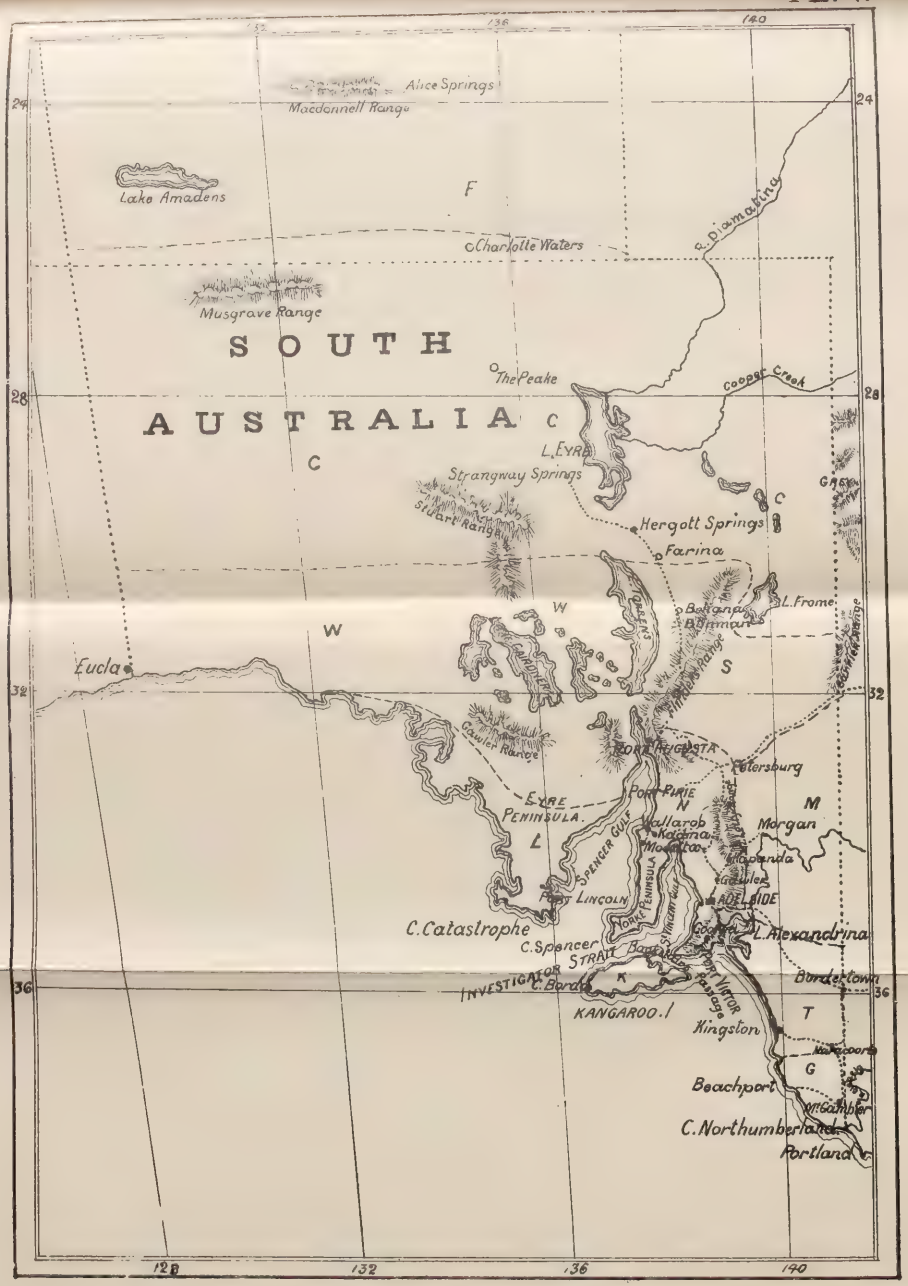
Thysanotus Patersoni
Xanthorrhœa Tatei
Triglochin procera
Juncus pauciflorus
" pallidus
Calastrophus fastigiatus
Centrolepis aristata
" strigosa
Schœnus Tepperi
Lepidosperma filiforme
Cladium schœnoides
" filum
Caustis pentandra
Carex paniculata
Sporobolus virginicus
Pteris aquilina
Lomaria discolor
Cheilanthes tenuifolia

PL. V.



132
136
140
24
36
Alice Springs
Macdonnell Range
Lake Amadens
F
INVESTIGATOR
C. Borda
K
KANGAROO. I
T. VICTOR
Passage
Kingston
Borderlown
T
G
Beachport
Mt Gambier
C. Northumberland
Portland
128

PL. V.



Alice Springs
Macdonnell Range
Lake Amadens
F
Charlotte Waters
R. Diamantina
Musgrave Range
SOUTH
AUSTRALIA
The Peake
Cooper Creek
C
L. Eyre
Strangway Springs
Stuart Range
Hergott Springs
Farina
Torrens
Beltana
Bunman
L. Frome
W
Eucla
Gawler Range
Port Augusta
Petersburg
Eyre Peninsula
Port Pirie
N
M
Morgan
Wallaroo
Kadina
Moonta
Spencer Gulf
L
Port Lincoln
Norke Peninsula
Adelaide
C. Catastrophe
C. Spencer
Strait
L. Alexandrina
Investigator
C. Borda
K
Port Victor
Passage
Kangaroo I.
Kingston
T
Beachport
G
Mt. Gambier
C. Northumberland
Portland
24
28
32
36
128
132
136
140

A Census of the Indigenous Flowering Plants and Vascular Cryptogams of Extra-Tropical South Australia.

By Professor Ralph Tate, F.L.S., F.G.S., &c.

[Read October 2, 1889].

Plate V.

Since the publication of a Census of the Native Plants of South Australia, in the volume of these Transactions for 1880, much activity has been shown in botanical research—greatly extending our knowledge of the species and their distribution, that it is deemed desirable to submit a Revised List.

To give some idea of the distribution of the constituents of the flora of extra-tropical South Australia, this part of the province is divided into the following regions and districts, as indicated on the accompanying map.

I. The Eremian Region.

This is limited by the rainfall-line of about ten inches, which dividing line on the south closely approximates to "Goyder's rainfall-line"—demarking the northern limit of successful wheat-cultivation. It comprises the "salt-bush" country of the pastoralist. About one-sixth of the species are extra-Australasian, chiefly of the Indo-Malay Province, whilst a large proportion of the endemic species belong to exotic genera.*

District F. This embraces the elevated country to the north of the Lake Eyre Basin, and drained by the tributaries of the River Finke, which have their sources in the McDonnell Range. The average annual rainfall does not exceed ten inches, but it is very irregular in its distribution.

District C. This is the most characteristic section of the Eremian Region; it is subject to severe droughts, and the rainfall does not exceed seven inches. It extends in a northerly direction, certainly as far as Charlotte Waters, is for the most part of low elevation, and comprised of Cretaceous and Tertiary clays and sands, except outlying masses of the Flinders Range which form hilly tracts of limited extent.

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* See Proc. Austr. Assoc. for the Advancement of Science, 1888, p. 312.

District S. This has a slightly increased rainfall as compared with C, and is mostly comprised of elevated ground in parallel ranges of not inconsiderable height, collectively called the Flinders Range. Outlying areas of District N., far within its boundary, occur at Wilpena Pound, at Blinman, and in a modified degree about Mount Serle; the inclusion of so many southern forms in the list for this district somewhat masks the truly desert-character of its prevailing flora. For its southern limit, I use the watershed-line, demarking the northern from the southern stream-courses.

District W. This is the south-western extension of C., and presents much the same physical characters. However, in the Gawler Range, there occurs a small collection of species, which belongs to more southern latitudes; otherwise the flora is essentially Eremian.

District M.—This area in its northern parts is a southerly extension of C and S; it comprises the Murray Desert, a plain which abuts on the west against the Adelaide Chain, and its north-east extension to the Barrier Range, and is constituted of Eocene and Pliocene strata, which are highly absorbent to water. Its south-western and southern limits, as defined by geological and topographical features, reach beyond the rainfall line of ten inches; and it becomes a question where best to fix the boundary, though on the whole there is an abrupt change in the flora wherever we pass from the Archæan to the Eocene rocks. The terrestrial flora is largely comprised of Eremian species, but the fluviatile and paludinal species are essentially Euronotian.

II. The Euronotian Region.

The flora of this region is of the type dominant in the wetter parts of temperate Australia, except the extreme south-west. It is essentially an aboriginal flora, being largely composed of endemic genera and species.

District A. Herein is presented one of the chief subtypes of the Euronotian flora, or at least such of it as occurs on the higher elevations of the Adelaide chain; the plants of the plains are more widely distributed throughout the Euronotian region of Australia.

District N. This comprises the country to the north of a line from the head of St. Vincent Gulf to the Burra. The elevated country about Wirrabirra and Mount Remarkable, with its relatively high rainfall, forms a small botanical outlier of the Adelaide chain.

District Y. The flora of Northern Yorke Peninsula is an extension of that of N; that of the southern part is not known, but we may anticipate certain affinities with L and K.

District L. Comprises Southern Eyre Peninsula, or the Port Lincoln district, and the costal tract extending to about Fowler Bay. The flora is essentially Euronotian, but the absence of certain characteristic species of A, and the presence of identical or closely-allied species of the Swan River district, impart a distinctinctive feature.

District K. The flora of Kangaroo Island is largely comprised of species proper to A and L, whilst it contains also species of Autochthonian origin which have here their eastern limit, and others of Victorian and Tasmanian origin which here reach their westernmost limit; it moreover contains several restricted species and one genus.

District T. Comprises the country south of M and east of Lake Alexandrina, and includes the Ninety-mile Desert and the Tatiara. It is largely constituted of Pliocene and Pleistocene sands and clays, occupying a low-lying region subject to inundation, and largely interspersed with marshes. In its south-east direction it is bounded by the low plateau of Eocene-limestones constituting the Mount Gambier district.

This district has not been botanically explored in any systematic manner; its species for the most part are Adelaidean, but towards the Victorian frontier it has received a few species which are restricted to the southern parts of the Wimmera-country.

District G. The extreme south-east corner of this colony is well defined both geologically and meteorologically. Physically it is an elevated plain comprised of Eocene-limestones, on which are reared cones of volcanic debris to heights of about 700 feet. The rainfall exceeds 25 inches within a line drawn from Guichen Bay to about Penola, though the limestone plateau continues northward beyond Narracoorte; within this area, thus roughly defined, many species characteristic of Southern Victoria and even of Tasmania have their most western limits, the most notable of which is the Sambucus, whilst the bulk of the species occurs in district A. None of its species are restricted.

RANUNCULACEAE.

Clematis, Linne (1737).

aristata, *R. Brown*	...	...	...	...	...	...	...	...	...	G
microphylla, *DeCandolle*	...	...	S	.	M	A	N	Y	L	K	T	G

Ranunculus, Linne (1737).

aquatilis, *Linne*	...	...	...	S	.	M	A	.	.	L	.	T	G
lappaceus, *Smith*	...	...	...	S	.	.	A	N	.	L	.	T	G
rivularis, *Banks & Solander*			...	.		M	A	N	.	.	K	T	G
parviflorus, *Linne*	...	...	C	S	W	M	A	N	Y	L	K	T	G

Myosurus, Linne.

minimus, *Linne*	...	...	...	S	.	M	.	.	.	.	.	T	

DILLENIACEAE.

Hibbertia, Andrews (1800).

hirsuta, *Bentham*	...	...	...	...	...	A						
sericea, *Bentham*	...	...	...	...	...	A	.	.	L	K	T	G
stricta, *R. Brown*	...	...	...	...	M	A	N	Y	L	K	T	G
Billardieri, *F. v. Mueller*	...	...	...		...	A	.	.	.	K		G
acicularis, *F. v. Mueller*	...	...	...		...	A	.	.	.	.	.	G
virgata, *R. Brown*	...	...	...	W	M	A	.	Y	.	K	.	.
fasciculata, *R. Brown*	...	...	...	...	...	A	.	.	L	K	T	G
glaberrima, *F. v. Mueller*	...	F										

LAURACEAE.

Cassytha, Osbeck (1753).

glabella, *R. Brown*	...	...	...	...	...	A	.	Y	L	K	.	G
pubescens, *R. Brown*	...	...	...	...	M	A	.	Y	L	K	.	G
melantha, *R. Brown*	...	...	...	W	M	A	.	Y	L	K	T	G

CERATOPHYLLEAE.

Ceratophyllum, Linne (1735).

demersum, *Linne*	...	...	...	...	M

PAPAVERACEAE.

Papaver, Linne.

aculeatum, *Thunberg*	...	...	...	...	M	A	N	Y	L	K	.	.

CAPPARIDAE.

Cleome, Linne.

viscosa, *Linne*	...	...	...	F

Capparis, Linne.

lasiantha, *R. Brown*	...	...	C				
spinosa, *Linne*	...	...	F				
Mitchelli, *Lindley*	...	...	F	C	S	.	M

CRUCIFERAE.

Nasturtium, R. Brown (1812).

terrestre, *R. Brown*	...	...	...	...	M	A					T	G

Cardamine, Linne.

eustylis, *F. v. Mueller*	...	...	...	...	M							
laciniata, *F. v. Mueller*	...	...	...		M	A	.	Y			T	G
flexuosa, *Withering*	...	...	...	...	...	A	N					G

Barbarea, Beckmann (1801).

vulgaris, *R. Brown*	...	...	...	...	...	A

Erysimum, Linne.

curvipes, *F. v. Mueller*... ... ... S W M . N
brevipes, *F. v. Mueller*... ... C S W M . N Y
lasiocarpum, *F. v. Mueller* ... F C . . M . . Y T .
Blennodia, *F. v. Mueller* ... F C S W

Sisymbrium, Linne.

filifolium, *F. v. Mueller* ... ... S W . N
trisectum *F. v. Mueller* ... F C S W M
nasturtioides, *F. v. Mueller* ... ... S W M . N
procumbens, *Tate* ... ... S
Richardsii, *F. v. Mueller* ... ... W
cardaminoides, *F. v. Mueller* ... C M T G

Cakile, Linne.

maritima *Scopoli* ... ... K

Stenopetalum, R. Brown (1821).

velutinum, *F. v. Mueller* ... F C . . M
lineare, *R. Brown* ... ... F . S . M A N Y L . . G
nutans, *F. v. Mueller* ... ... F C
sphaerocarpum, *F. v. Mueller*... ... ... A N Y T
trisectum, *Tate* C

Geococcus, Drummond & Harvey (1855).

pusillus, *Drummond & Harvey* ... W M Y

Alyssum, Linne.

minimum, *Pallas* ... ... S W M . N Y

Menkea, Lehmann (1843).

australis, *Lehmann* ... ... M
sphaerocarpa, *F. v. Mueller* ... F

Capsella, Moench (1792).

pilosula, *F. v. Mueller* ... ... W M Y
elliptica, *F. v. Mueller*... ... ... S W M A N Y L K T G
humistrata, *F. v. Mueller* ... ... M
cochlearina, *F. v. Mueller* ... ... S W N
Drummondi, *F. v. Mueller* ... ... W

Lepidium, Linne.

strongylophyllum, *F. v. Mueller* F
leptopetalum, *F. v. Mueller* ... ... S M
rotundum, *DeCandolle* ... ... F C
phlebopetalum, *F. v. Mueller*... F C S M
monoplocoides, *F. v. Mueller* ... C M Y
papillosum, *F. v. Mueller* ... F C S W M N
ruderale, *Linne* ... ... F C S . M A N Y . K T G
foliosum, *Desvaux* ... ... K T

VIOLACEAE.

Viola, Linne.

hederacea, *Labillardiere* ... ... A K G
betonicifolia, *Smith* ... ... A G

Hybanthus, Jacquin (1763).

floribundus, *F. v. Mueller* ... ... W A T G
enneaspermus, *F. v. Mueller* ... F
Tatei, *F. v. Mueller* ... ... S

Hymenanthera, R. Brown (1818).

Banksii, *F. v. Mueller* ... ... A

DROSERACEAE.

Drosera, Linne (1737).

binata, *Labillardiere* ... ... A . . . . . G
glanduligera, *Lehm.* ... ... A Y L K T G
Whittakerii, *Planchon*... ... ... A Y . K T G
pygmaea, *DeCandolle* ... ... A L K T G
spathulata, *Labillardiere* ... ... G
Burmanni, *Vahl*... ... ... F
Indica, *Linne* ... ... F
Menziesii, *R. Brown* ... ... C A N Y L K . G
auriculata, *Backhouse* ... ... S A N K . G
peltata, *Smith* ... ... A N . L T G

FRANKENIACEAE.

Frankenia, Linne.

laevis, *Linne* ... ... F C S W M A N Y L K T G

PITTOSPOREAE.

Pittosporum, Banks (1788).

phillyraeoides, *DeCandolle* ... F C S W M A N Y L K T G

Bursaria, Cavanilles (1797).

spinosa, *Cavanilles* ... . S . M A N Y L K T G

Marianthus, Huegel (1837).

bignoniaceus, *F. v. Mueller* ... ... A K

Billardiera, Smith (1793).

scandens, *Smith*... ... ... L K G
cymosa, *F. v. Mueller* ... ... A N Y L K T G

Cheiranthera, Cunningham (1829).

linearis, *Cunningham* ... ... A N Y L K
volubilis, *F. v. Mueller* ... ... K

POLYGALEAE.

Polygala, Linne.

Chinensis, *Linne* ... ... F

Comesperma, Labillardiere (1806).

scoparium, *Steetz*				W	M					L				
volubile, *Labillardiere*						A		Y	L	K	.	G		
sylvestre, *Lindley* ...			F	.	S									
viscidulum, *F. v. Mueller*			F											
calymega. *Labillardiere*						A			L	K	T	G		
polygaloides, *F. v. Mueller*						A			L	K	T	G		

ELATINEAE.

Elatine, Linne (1737).

Americana, *Arnott*			S		M								G	

Bergia, Linne (1771).

ammannioides, *Roxburgh* ...		C		M										
perennis, *F. v. Mueller* ...	F													

HYPERICINEAE.

Hypericum, Linne.

Japonicum, *Thunberg*	F	C				A	N	.	.	K	T	G		

RUTACEAE.

Correa, Smith (1798).

aemula, *F. v. Mueller*						A				K		G		
alba, *Andrews*						A				K		G		
speciosa, *Andrews*				W	.	A	N	Y	L	K	T	G		
decumbens, *F. v. Mueller*						A				K				

Zieria, Smith (1798).

veronicea, *F. v. Mueller*						A				K				

Boronia, Smith (1798)

Edwardsi, *Bentham*						A				K				
coerulescens, *F. v. Mueller*				W		A	N		L	K	T	G		
filifolia, *F. v. Mueller*						A				K	T	G		
clavellifolia, *F. v. Mueller*				W	.			Y		.	T			
parviflora, *Smith*						A				K				
polygalifolia, *Smith*						A						G		
pinnata, *Smith*							...		...		T	G		

Eriostemon, Smith (1798).

obovalis, *Cunningham*							...		...		T			
linearis, *Cunningham*				W										
difformis, *Cunningham*				W	M	A			L	K	T			
lepidotus, *Sprengel*					.	.		.	.	.	T			
stenophyllus, *F. v. Mueller*				...			...		...		T			
sediflorus, *F. v. Mueller*				W	M		N	Y			T			
pungens, *Lindley*						A			L		T			
Hillebrandi, *F. v. Mueller*						A								
brachyphyllus, *F. v. Mueller*						A			L					
capitatus, *F. v. Mueller*				W			N	Y	L	K				

Geijera, Schott (1834).

salicifolia, *Schott* ... ... M
parviflora, *Lindley* ... ... S W M · N Y L K

MELIACEAE.

Owenia, F. v. Mueller (1857).

acidula, *F. v. Mueller* ... ... F

LINEAE.

Linum, Linne.

marginale, *Cunningham* ... ... M A N Y L T G

ZYGOPHYLLEAE.

Tribulus, Linne (1735).

terrestris, *Linne* ... ... F C S W M T
hystrix, *R. Brown* ... ... F C
macrocarpus, *F. v. Mueller* ... F
Forrestii, *F. v. Mueller* ... F
platypterus, *Bentham* ... ... F
hirsutus, *Bentham* ... ... F
astrocarpus, *F. v. Mueller* ... F

Zygophyllum, Linne (1735).

apiculatum, *F. v. Mueller* ... F S W M N
fruticulosum, *DeCandolle* ... F C S W M . N Y
ammophilum, *F. v. Mueller* ... F C W M Y L K T
Billardieri, *De Candolle* ... C S W M A ? Y L K T G
prismatothecum, *F. v Mueller* ... S
Howittii, *F. v. Mueller* ... C S
glaucescens, *F. v. Mueller* ... C W M A N Y L
crenatum, *F. v. Mueller* ... ... W M N Y
iodocarpum, *F. v. Mueller* ... F C S W M

Nitraria, Linne (1759).

Schoeberi, *Linne* ... ... C S W M A N Y L K T

GERANIACEAE.

Pelargonium, L'Heritier (1787).

australe, *Willdenow* ... ... S A N Y L K T G
Rodneyanum, *Mitchell*... ... ... A T G

Geranium, Linne.

pilosum, *Solander* ... ... S W M A N Y L K T G

Erodium, L'Heritier (1787).

cygnorum, *Nees*... ... ... F C S W M A N Y L K T G

Oxalis, Linne (1737).

corniculata, *Linne* ... ... F . S W M A N Y L K T G

SAPINDACEAE.

Diplopeltis, Endlicher (1837).

Stuartii, *F. v. Mueller* ... ... F

Atalaya, Blume (1847).

hemiglauca, *F. v. Mueller* ... F C

Heterodendron, Desfontaines (1818).

oleaefolium, *Desfontaines* ... F C S W M . N Y

Dodonaea, Linne (1737).

viscosa, *Linne* ... ... F C S W M A N Y L K T G
petiolaris, *F. v. Mueller* ... F
lanceolata, *F. v. Mueller* ... F
procumbens, *F. v. Mueller* ... ... G
lobulata, *F. v. Mueller* ... ... S W M N
bursarifolia, *Behr & F. v. M.* ... ... M A Y K
Baueri, *Endlicher* ... ... M N Y L K G
hexandra, *F. v. Mueller* ... ... A Y L
humilis, *Endlicher* ... ... W Y L K T
boronifolia, *G. Don* ... ... Y
macrozyga, *F. v. Mueller* ... F
tenuifolia, *Lindley* ... ... S
stenozyga, *F. v. Mueller* ... ... W Y T
microzyga, *F. v. Mueller* ... F C S W N

STACKHOUSIEAE.

Stackhousia, Smith (1798).

megaloptera, *F. v. Mueller* ... ... F
spathulata, *Sieber* ... ... K G
linarifolia, *Cunningham* ... ... M A N Y L K T G
flava, *Hooker* ... ... A Y L K
muricata, *Lindley* ... ... F
viminea, *Smith* ... ... F

Macgregoria, F. v. Mueller (1873).

racemigera, *F. v. Mueller* ... F

PHYTOLACCEAE.

Didymotheca, J. Hooker (1847).

thesioides, *Hooker* ... ... Y L K . G
pleiococca, *F. v. Mueller* ... F M A K T G

Gyrostemon, Desfontaines (1820).

ramulosus, *Desfontaines* ... F W

Codonocarpus, Cunningham (1830).

pyramidalis, *F. v. Mueller* ... S
cotinifolius, *F. v. Mueller* ... F C M N

MALVACEAE.

Plagianthus, R. & G. Forster (1776).

Berthae, *F. v. Mueller*...	...	...	...	...	...	Y						
spicatus *Bentham* ...	...	...	...	M		Y		K	T	G		
glomeratus, *Bentham* ...	...	F	C	S	W		Y	L				
microphyllus, *F. v. Mueller* ...	...	...	...	...	A	N	.	L	.	T	G	

Sida, Linne (1737).

corugata, *Lindley* ...	...	F	C	S	W	M	A	N	Y			
intricata, *F. v. Mueller*	...		C					N				
virgata, *Hooker* ...	...	F	C	S	W							
cardiophylla, *F. v. Mueller*	...	F										
cryphiopetala, *F. v. Mueller*	...	F										
petrophila, *F. v Mueller*	...	F	C	S	W			N				
calyxhymenia, *J. Gay* ...	...		...		W							
rhombifolia, *Linne* ...	...	F										
inclusa, *Bentham* ...	...	F	C									
platycalyx, *F. v. Mueller*	...	F										
lepida, *F. v Mueller* ...	...	F										

Howittia, F. v. Mueller (1855).

trilocularis, *F. v. Mueller*	...	...	...	...	...	...					T	

Abutilon, Gaertner (1791).

tubulosum, *Hooker* ...	...	F										
leucopetalum, *F. v. Mueller*	...		C									
Mitchelli, *Bentham* ...	...	F		S								
cryptopetalum, *F. v. Mueller*	...	F										
otocarpum, *F v. Mueller*	...	F	C			M						
Avicennae, *Gaertner* ...	...		C			M						
oxycarpum, *F. v. Maeller*	...		C									
Fraseri, *Hooker* ...	...	F	C	S								
halophilum, *F. v. Mueller*	...		C	S								
macrum, *F. v. Mueller* ...	...	F			W							

Lavatera, Linne.

plebeia, *Sims* ...	...	F	C	S	W	M	A	N	Y	L	K	T	G

Malvastrum, Asa Gray (1849).

spicatum, *A. Gray* ...	...	F	C	S	W							

Hibiscus, Linne (1735).

trionum, Linne ...	...		C									
brachysiphonius, *F. v. Mueller*			C									
microchlaenus, *F. v. Mueller*	...	F	.	.	W							
Pinonianus, *Gaudichd.* ...	...	F	C									
Krichauffii, *F. v. Mueller*	...		C	S	W	M						
Sturtii, *Hooker* ...	...	F	C									
Farragei, *F. v. Mueller*...	...	F			W							
Wrayae, *Lindley* ...	...		...		W			N	Y	L		
hakeaefolius, *Giord.* ...	...		...	S	W					L		

Gossypium, Linne (1737).

australe, *F. v. Mueller* ...	...	F										
Sturtii, *F. v. Mueller* ...	...	F	C	S								

TILIACEAE.

Triumfetta, Linne.

Winneckeana, *F. v. Mueller* ... F

Corchorus, Linne.

sidoides, *F. v. Mueller* ... ... F
Elderi, *F. v. Mueller* ... ... F

STERCULIACEAE.

Hermannia, Linne.

Gilesii, *F. v. Mueller* ... ... F

Waltheria, Linne (1737).

Indica, *Linne* ... ... F

Melhania, Forskael (1775).

incana, *Heyne* ... ... F

Commergonia, R. & G. Foster (1776).

magniflora, *F. v. Mueller* ... F
loxophylla, *F. v. Mueller* ... F
Kempeana, *F. v. Mueller* ... F
Tatei, *F. v. Mueller* L

Brachychiton,, Schott & Endlicher (1832).

Gregorii, *F. v. Mueller* ... ... F

Seringia, Sprengel (1818).

corollata, *Steetz* ... ... F
nephrosperma, *F. v. Mueller* ... F
integrifolia, *F. v. Mueller* ... F

Hannafordia, F. v. Mueller (1860).

Bissillii, *F. v. Mueller* ... ... F

Thomasia, J. Gay (1821).

petalocalyx, *F. v. Mueller* ... ... A . Y L K T

Lasiopetalum, Smith (1798).

discolor, *Hooker* ... ... W A Y L K G
Behrii, *F. v. Mueller* ... ... M A N Y L K
Baueri, *Steetz* ... ... W . A . Y L K T
Tepperi, *F. v. Mueller* ... ... Y
Schulzenii, *F. v. Mueller* ... ... L K T G

TREMANDREAE.

Tetratheca, Smith (1793).

ciliata, *Lindley* ... ... G
ericifolia, *Smith* ... ... A K G

EUPHORBIACEAE.

Euphorbia, Linne (1737).

erythrantha, *F. v. Mueller* ... C S W M
Drummondii, *Boissier* ... ... F C S W M A N Y T
Wheeleri, *Baillon* C
eremophila, *Cunningham* ... F C S W M A N

Poranthera, Rudge (1811).

microphylla, *Brongniart* ... ... M A Y L K T G
ericoides, *Klotzsch* ... ... A L K

Micrantheum, Desfontaines (1818).

hexandrum, *Hooker* ... ... A K

Pseudanthus, Sieber (1837).

micranthus, *Bentham* ... ... A

Phyllanthus, Linne (1737).

thesioides, *Bentham* ... ... F
rigens. *J. Mueller* ... ... S
rhytidospermus, *F. v. Mueller* F . S
Tatei, *F. v. Mueller* ... ... A N
calycinus, *Labillardiere* ... ... S N L T
Fuernrohrii, *F. v. Mueller* ... C S M
trachyspermus, *F. v. Mueller* ... ... M
lacunarius, *F. v. Mueller* ... F C S M
australis, *J. Hooker* ... ... K
thymoides, *Sieber* ... ... A K T
Gunnii, *J. Hooker* ... ... S A N

Amperea, A. de Jussieu (1824).

spartioides, *Brongniart* ... ... G

Monotaxis, Brongniart (1829).

luteiflora, *F. v. Mueller* ... F

Beyeria, Miquel (1844).

viscosa, *Miquel* ... ... A .
opaca, *F. v. Mueller* ... ... W M A . Y L K T G
uncinata, *F. v Mueller* ... ... M

Ricinocarpus, Desfontaines (1817).

pinifolius, *Desfontaines* ... ...

Bertya, Planchon (1845).

Mitchelli, *J. Mueller* ... ... M A
rotundifolia, *F. v. Mueller* ... ... K

Adriana, Gaudichaud (1825).

quadripartita, *Gaudichaud* ... ... M A . Y L K T G
tomentosa, *Gaudichaud* ... F M

PORTULACEAE.

Portulaca, Linne.

	F	C	S	W	M	A	N	Y	L	K	T	G
oleracea, *Linne*	F	C	S		M							
australis, *Endlicher*	F											
filifolia, *F. v. Mueller*	F	C										
bicolor, *F. v. Mueller*	F											

Claytonia, Linne (1737).

	F	C	S	W	M	A	N	Y	L	K	T	G
pleiopetala, *F. v. Mueller*		C		W								
Balonnensis, *F. v. Mueller*	F	C	S	W								
polyandra, *F. v. Mueller*			S	W								
volubilis, *F. v. Mueller*			S	W	M	A	N	Y	L	K	T	
ptychosperma, *F. v. Mueller*		C	S									
brevipedata, *F. v. Mueller*						A			L			
calyptrata, *F. v. Mueller*						A		Y	L	K		
pumila, *F. v. Mueller*	F											
corrigiolacea, *F. v. Mueller*	F				M			Y	L			
Australasica, *Hooker*						A						G
pygmaea, *F. v. Mueller*					M	A		Y			T	

CARYOPHYLLEAE.

Saponaria, Linne (1737).

	F	C	S	W	M	A	N	Y	L	K	T	G
tubulosa, *F. v. Mueller*			S		M	A	N	Y			T	

Stellaria, Linne (1753).

	F	C	S	W	M	A	N	Y	L	K	T	G
pungens, *Brongniart*												G
glauca, *Withering*					M	A				K		G
multiflora, *Hooker*					M	.	N					G

Drymaria, Willdenow (1819).

	F	C	S	W	M	A	N	Y	L	K	T	G
filiformis, *Bentham*					M			Y				

Sagina, Linne (1737).

	F	C	S	W	M	A	N	Y	L	K	T	G
apetala, *Linne*			S		M	A	N	Y	.	K	.	G

Colobanthus, Bartling (1830).

	F	C	S	W	M	A	N	Y	L	K	T	G
Billardieri, *Fenzl*												G

Spergularia, Persoon (1805).

	F	C	S	W	M	A	N	Y	L	K	T	G
rubra, *Cambessedes*			S	W	M	A	N	Y	L	K	T	
marina, *Wahlenb.*					M	A	N	Y	.	K	T	

Polycarpon, Linne (1758).

	F	C	S	W	M	A	N	Y	L	K	T	G
tetraphyllum, *Linne*						A			L			

Polycarpaea, Lamarck (1792).

	F	C	S	W	M	A	N	Y	L	K	T	G
synandra, *F. v. Mueller*		C										
Indica, *Lamarck*	F	C										

ILLECEBRACEAE.

Herniaria, Linne.

	F	C	S	W	M	A	N	Y	L	K	T	G
incana, *Lamarck*			S	.	M							

Scleranthus, *Linne* (1737).

pungens, *R. Brown*	...	...	...		W	M	A	N	.	L	.	T		
diander, *R. Brown*	...	...	...	...		...		...		...		...	G	

POLYGONACEAE.

Rumex, Linne (1737).

Brownii, *Campdera*	...	...	...	...		...	A		Y	L	K		G	
flexuosus, *Solander*	...	...	...	...		M	A							
crystallinus, *Lange*	...	...	F	C		M								
bidens, *R. Brown*	...	...	...	...		M	A						G	

Polygonum, Linne.

plebeium, *R. Brown*	...	...	F	C			M	A				T		
prostratum, *R. Brown*	...	...		...		...	M	.	N				G	
lapathifolium, *Linne*	...	...		...		...		...		...		...	G	
hydropiper, *Linne*	...	...		...		...		...		...		...	G	
minus, *Hudson*	...	...		..	S		M	A	.				G	
attenuatum, *R. Brown*	...	...		C										

Muehlenbeckia, Meissner (1840).

adpressa, *Meissner*	...	...	...		W	.	A	.	Y	L	K	.	G	
Cunninghamii, *F. v. Mueller*	...	F	C	S		M	A			L		T		
polygonoides, *F. v. Mueller*	...	...		...		M								

CHENOPODIACEAE.

Atriplex, Linne.

stipitatum, *Bentham*	...	...		S	W	M								
paludosum, *R. Brown*	...	...			W	.	A	N	Y	L	K			
mummularium, *Lindley*	...	F	C	S	W	M								
cinereum, *Poiret*	...	...		...		M	A	N	Y	L	K	T	G	
vesicarium, *Heward*	...	F	C	S	W	M	.	N						
rhagodioides, *F. v. Mueller*	...		C	S	.	M								
incrassatum, *F. v. Mueller*	...		C											
velutinellum, *F. v. Mueller*	...	F	C	S	W	M								
fissivalve, *F. v. Mueller*	...		C	S	W									
Quinii, *F. v. Mueller*	...		C	S										
angulatum, *Bentham*	...		C	S	.	M								
semibaccatum, *R. Brown*	...		...		...	M	A							
Muelleri, *Bentham*	...	F	.	S		M			Y					
prostratum, *R. Brown*	...		...	S		M	.	N	Y	L	K			
leptocarpum, *F. v. Mueller*	...	F	C	S		M								
limbatum, *Bentham*	...	F		S		M								
crystallinum, *Hooker*	...	...		...		...		...		...		...	G	
halimoides, *Lindley*	...		C	S	W	M								
holocarpum, *F. v. Mueller*	...	F	C	S	W	M								

Dysphania, R. Brown (1810).

plantaginella, *F. v. Mueller*	...	F	.	.	W									
simulans, *F. v. Mueller & Tate*	...	F	C											
litoralis, *R. Brown*	...	...		C	S	.	M			.				

Rhagodia, R. Brown (1810).

Billardieri, *R. Brown*						M	A	.	Y	L		T	G
parabolica, *R. Brown*				S		M	A	N	Y			T	
Gaudichaudiana, *Moquin*					W	M							
crassifolia, *R. Brown*			C		W	M			Y	L	K	T	
Preissii, *Moquin*					W	.			Y				
spinescens, *R. Brown*		F	C	S	W	M			Y				
nutans, *R. Brown*		F	C	S	.	M	A		Y	L	K	T	

Chenopodium, Linne.

nitrariaceum, *F. v. Mueller*			S	W	M	A	.	Y				
auricomum, *Lindley*	F	C	S	.	M							
microphyllum, *F. v. Mueller*					M	A	N	Y	L			
rhadinostachyum, *F. v. Mueller*	F											
carinatum, *R. Brown*	F	C	S	W	M	A	N	Y	.	K	.	G
cristatum, *F. v Mueller* ...		C	S	W	M	.	N					
atriplicinum, *F. v. Mueller*			S		M							

Enchylaena, R. Brown (1810).

tomentosa, *R. Brown*	F	C	S	W	M	A	N	Y	L	K	.	G

Threlkeldia, R. Brown (1810).

diffusa, *R. Brown*						A				K			

Kochia, Roth (1799).

fimbriolata, *F. v. Mueller*			S	W									
lanosa, *Lindley*	F	C	S	W	M								
lobiflora, *F. v. Mueller*			S	W									
oppositifolia, *R. Brown*				W	.	A	N	Y	L	K	T		
brevifolia, *R. Brown*	F	.	S	W	M	A	N	Y	L				
triptera, *Bentham*	F	C	S		M								
decaptera, *F. v. Mueller*				W									
pentatropis, *Tate*			S										
pyramidata, *Bentham*	F		S		M								
eriantha, *F. v. Mueller*... ...	F	C	S	W	.		N						
spongiocarpa, *F. v. Mueller* ...	F												
villosa, *Lindley*	F	C	S	W	M	A		Y			T		
sedifolia, *F. v. Mueller*... ...		C	S	W	M								
aphylla, *R. Brown*	F	C	S	W	M	A							
humillima, *F. v. Mueller* ...		...		...	M			Y					
ciliata, *F. v. Mueller*		C	S	W	M								
brachyptera, *F. v. Mueller* ...		C	S	.	M	.	N						
stelligera, *F. v. Mueller* ...		...		...	M								

Bassia, Allioni (1766).

salsuginosa. *F. v. Mueller*				...	M		N						
enchylaenoides, *F. v. Mueller*...				...	.	A	N	Y					
Dallachyana, *Bentham*			S		M								
tricornis, *Bentham*			S	.	M								
biflora, *F. v. Mueller*			S	.	M	A	N		L				
paradoxa, *F. v. Mueller* ...	F	.	S	W	M		N						
lanicuspis, *F. v. Mueller* ...	F	C	S	W									
diacantha, *F. v. Mueller* ...	F	C	S	W	M	A	N	Y	L				
uniflora, *F. v. Mueller*		C	S	W									
bicornis, *F. v. Mueller*	F	C	S										

eriochiton, *Tate*...	F	.	S	W	M									
Cornishiana, *F. v. Mueller* ...		C												
quinquecuspis, *F. v. Mueller* ...	F	C	S	.	M									
echinopsila, *F. v. Mueller* ...		...	S	.	M									
divaricata, *F. v. Mueller* ...		C	S	W	M									
bicuspis, *F. v. Mueller*		C	S											

Babbagia, F. v. Mueller (1858).

dipterocarpa, *F. v. Mueller* ...	F	C	S											
acroptera, *F. v. Mueller & Tate*		C	S											
pentaptera, *F. v. Mueller & Tate*		.	S											

Salicornia, Linne.

robusta, *F. v. Mueller*		...		...	M									
arbuscula, *R. Brown*		C	S	W	M	A	N	Y	L	K	T	G		
australis, *Solander*		C	S	W	.	A	.	Y	L	K	T	G		
tenuis, *Bentham*...		...	S											
leiostachya, *Bentham*	F	C												

Salsola, Linne (1737).

Kali, *Linne*	F	C	S	W	M	A	N	Y	L	.	T	G		

Suaeda, Forskael (1779).

maritima, *Dumortier*				...	M	A	.	Y	L	K	.	G		

AMARANTACEAE.

Euxolus, Rafinesque (1836).

Mitchelli, *F. v. Mueller* ...	F	C	S		M									

Polycnemon, Linne (1742).

pentandrum, *F. v. Mueller* ...						A				K	T	G		
diandrum, *F. v. Mueller* ...		C		W					L					
mesembrianthemum, *F. v. M.*		C												

Ptilotus, R. Brown (1810).

obovatus, *F. v. Mueller* ...	F	C	S	W	M	.	N							
incanus, *Poiret*	F	C	S											
exaltatus, *Nees*		C	S	W										
Beckeri, *F. v. Mueller*		...		...	...		...		L	K				
gomphrenoides, *Moquin* ...		...		...	...		...		L					
helipteroides, *F. v. Mueller* ...	F	.												
erubescens, *Schlechtendal* ...		...		...	M	A	N				T			
alopecuroideus, *F. v. Mueller* ...	F	C	S	W	M	A								
nobilis, *F. v. Mueller*	F	.	S		M	A	N							
macrocephalus, *Poiret*		...		...	...		...		...		T	G		
spathulatus, *Poiret*		...		W	M	A	N	Y	L	.	T	G		
hemisteirus, *F. v. Mueller* ...	F			W										
Schwartzii, *F. v. Mueller* ...	F													
leucocoma, *Moquin*	F	C												
parvifolius, *F. v. Mueller* ...		C												
Hoodii, *F. v. Mueller*	F													
Murrayi, *F. v. Mueller*... ...		C												
latifolius, *R. Brown*	F	C												

Achyranthes, Linne (1737).

aspera, *Linne* ... ... F

Alternanthera, Forskael (1775).

triandra, *Lamarck* ... ... F C S M A K G
nana, *R. Brown* ... ... F

Gomphrena, Linne (1737).

Brownii, *Moquin* ... ... F

PLUMBAGINEAE.

Plumbago, Linne.

Zeylanica, *Linne* ... ... F

NYCTAGINEAE.

Boerhaavia, Linne.

diffusa, *Linne* ... ... F C S W M A N
repanda, *Willdenow* ... ... C S

URTICACEAE.

Trema, Loureiro.

cannabina, *Loureiro* ... ... F

Ficus, Linne.

platypoda, *Cunningham* ... F
orbicularis, *Cunningham* ... F

Parietaria, Linne.

debilis, *G. Forster* ... ... F C S W M A N Y L K T G

Urtica, Linne.

incisa, *Poiret* ... ... M A K G

CASUARINEAE.

Casuarina, Linne (1737).

quadrivalvis, *Labillardiere* ... ... S W A Y L K T G
glauca, *Sieber* ... ... S M
lepidophloia, *F. v. Mueller* ... ... M
suberosa, *Otto & Dietrich* ... ... T
bicuspidata, *Bentham* L
Decaisneana, *F. v. Mueller* ... F
humilis, *Otto & Dietrich* ... ... W
distyla, *Ventenat* ... ... S A N Y L K T G

LEGUMINOSAE.

Brachysema, R. Brown (1811).

Chambersii, *F. v. Mueller* ... F

Isotropis, Bentham (1837).

atropurpurea, *F. v. Mueller* ... F
Wheeleri, *F. v. Mueller* ... F C
Winneckei, *F. v. Mueller* ... F

Gompholobium, Smith (1798).

minus, *Smith*							A	.	.	L	K	T	G

Burtonia, R. Brown (1811).

polyzyga, *Bentham* ... ... F

Mirbelia, Smith (1805).

oxyclada, *F. v. Mueller* ... F

Sphaerolobium, Smith (1805).

vimineum, *Smith*							A					T	G

Viminaria, Smith (1804).

denudata, *Smith*							A	N				T	G

Daviesia, Smith (1798).

arthropoda, *F. v. Mueller* ... F													
corymbosa, *Smith*							A				K		
horrida, *Meissner*								N					
pectinata, *Lindley*								...		L			
ulcina, *Smith* ... ... S A								N				T	G
genistifolia, *Cunningham*								N	Y	L	K	T	
incrassata, *Smith*							A			L	K		
brevifolia, *Lindley*							A			L	K	T	G

Aotus, Smith (1805).

villosa, *Smith*								...		...		...	G

Phyllota, DeCandolle (1825).

pleurandroides, *F. v. Mueller*...							A	.			K		G
Sturtii, *Bentham* ... ... F													

Eutaxia, R. Brown (1811).

empetrifolia, *Schlechtendal*							M	A	N	Y	L	K	T	G

Dillwynia, Smith (1805).

hispida, *Lindley*							A				L			G
ericifolia, *Smith*...							A					T	G
floribunda, *Smith*							A					K		G
cinerascens, *R. Brown*								...		...		...		G
patula, *F. v. Mueller*								...		L		T		

Gastrolobium, R. Brown (1811).

elachistum, *F. v. Mueller* ... ... W
grandiflorum, *F. v. Mueller* ... F

Pultenaea, Smith (1793).

daphnoides, *Wendland*...							A				K		
stricta, *Sims*								...		...		...	G
mucronata, *F. v. Mueller*							A						
scabra, *R. Brown*								...		...	K		
mollis, *Lindley*								...		L			

	F	C	S	W	M	A	N	Y	L	K	T	G
rigida, *R. Brown*									L	K		
acerosa, *R. Brown*						A			L	K		
vestita, *R. Brown*									L		T	
canaliculata, *F. v. Mueller*						A			L	K		
largiflorens, *F. v. Mueller*						A						
laxiflora, *Bentham*						A						
prostrata, *Bentham*											T	
involucrata, *Bentham*						A				K		G
pedunculata, *Hooker*						A			L			
humilis, *Bentham*												G
graveolens, *Tate*						A						
tenuifolia, *R. Brown*						?		Y	?	K		G
densifolia, *F. v. Mueller*						A			L		T	
villifera, *Sieber*						A			L			
viscidula, *Tate*										K		

Platylobium, Smith (1794).

	F	C	S	W	M	A	N	Y	L	K	T	G
obtusangulum, *Hooker*						A				K		G
triangulare, *R. Brown*												G

Bossiaea, Ventenat (1800).

	F	C	S	W	M	A	N	Y	L	K	T	G
prostrata, *R. Brown*						A						G
cinerea, *R. Brown*												G
riparia, *Cunningham*									L			
Battii, *Tate*				W								
Walkeri, *F. v. Mueller*				W								

Templetonia, R. Brown (1812).

	F	C	S	W	M	A	N	Y	L	K	T	G
retusa, *R. Brown*			S	W			N		L	K		
Muelleri, *Bentham*												G
aculeata, *Bentham*			S									
egena, *Bentham*	F		S	W	M							
sulcata, *Bentham*					M			Y				

Hovea, R. Brown (1812).

	F	C	S	W	M	A	N	Y	L	K	T	G
longifolia, *R. Brown*							N				T	
heterophylla, *Cunningham*											T	G

Nematophyllum, F. v. Mueller (1857).

	F	C	S	W	M	A	N	Y	L	K	T	G
Hookeri, *F. v. Mueller*	F											

Goodia, Salisbury (1806).

	F	C	S	W	M	A	N	Y	L	K	T	G
lotifolia, *Salisbury*						A						G
medicaginea, *F. v. Mueller*				W		A	N	Y	L	K	.	G

Ptychosema, Bentham (1839).

	F	C	S	W	M	A	N	Y	L	K	T	G
anomalum, *F. v. Mueller*	F											
trifoliolatum, *F. v. Mueller*		C										

Crotalaria, Linne.

	F	C	S	W	M	A	N	Y	L	K	T	G
linifolia, *Linne*	F											
Mitchelli, *Bentham*	F	C										
Cunninghamii, *R. Brown*	F	C										
dissitiflora, *Bentham*	F	C	S									
medicaginea, *Lamarck*	F											
incana, *Linne*	F											

Æschynomene, Linne (1737).

Indica, *Linne* ... ... F C

Glycyrrhiza, Linne.

psoraleoides, *Bentham* ... ... M

Indigofera, Linne.

linifolia, *Retzius* ... ... F
monophylla, *DeCandolle* ... F
enneaphylla, *Linne* ... ... F
viscosa, *Lamarck* ... ... F C
hirsuta, *Linne* ... ... F C
australis, *Willdenow* ... ... F A N G
brevidens, *Bentham* ... ... F C
coronillifolia, *Cunningham* ... F

Tephrosia, Persoon (1807).

purpurea, *Persoon* ... ... F .
sphaerospora, *F. v. Mueller* ... F

Sesbania, Persoon (1807).

aculeata, *Persoon* ... ... F C M

Clianthus, Banks & Solander (1832).

Dampieri, *Cunningham* ... C S W

Swainsonia, Salisbury (1806).

Greyana, *Lindley* ... ... M
coronillifolia, *Salisbury* ... C
colutoides, *F. v. Mueller* ... ... W
phacoides, *Bentham* ... ... F C S M A . Y
Burkittii, *F. v. Mueller* ... ... W
oligophylla, *F. v. Mueller* ... F C
Burkei, *F. v. Mueller* ... ... F
oroboides, *F. v. Mueller* C
campylantha, *F. v. Mueller* ... C S
procumbens, *F. v. Mueller* ... C . M A N . G
stipularis, *F. v. Mueller* ... C S W M A N
Oliverii, *F. v. Mueller* ... ... W
lessertiifolia, *DeCandolle* ... ... W M A N Y K T G
unifoliolata, *F. v. Mueller* ... F
microphylla, *A. Gray* ... ... F W M T
laxa, *R. Brown* ... ... F M Y

Lespedeza, A. Richard (1803).

lanata, *Bentham*... ... ... F

Psoralea, Linne (1742).

adscendens, *F. v. Mueller* ... ... A G
parva, *F. v. Mueller* ... ... A
patens, *Lindley* ... ... F C S W M A N G
eriantha, *Bentham* ... ... F S . M
balsamica, *F. v. Mueller* ... F
leucantha, *F. v. Mueller* ... F

Trigonella, Linne (1737).

suavissima, *Lindley* ... ... F C S

Lotus, Linne (1737).

corniculatus, *Linne* ... ... A G
australis, *Andrews* ... ... F C S W M A N Y L K T G

Kennedya, Ventenat (1804).

monophylla, *Ventenat* ... ... A Y L K
prostrata, *R. Brown* ... ... A Y L K T G
prorepens, *F. v. Mueller* ... F

Glycine, Linne (1737).

clandestina, *Wendland*... ... F S W M A N Y ? G
Latrobeana, *Bentham* ... ... A G
falcata, *Bentham* C
tabacina, *Bentham* ... ... C S W N
sericea, *Bentham* ... ... F C M
tomentosa, *Bentham* C

Erythrina, Linne (1737).

vespertilio, *Bentham* ... ... F

Rhynchosia, Loureiro (1790).

minima, *DeCandolle* ... ... F . S

Galactia, P. Browne (1756).

tenuiflora, *Wight & Arnott* ... F

Vigna, Savi (1824).

lanceolata, Bentham ... ... F C

Cassia, Linne.

Sophera, *Linne* ... ... F C S
venusta, *F. v. Mueller* ... ... F
notabilis, *F. v. Mueller* ... F
pleurocarpa, *F. v. Mueller* ... F C
glutinosa, *DeCandolle* ... ... F
pruinosa, *F. v. Mueller* ... C
desolata, *F. v. Mueller*... ... F C S
Sturtii, *R. Brown* ... ... C S W M Y
artemisioides, *Gaud.* ... ... F S W
eremophila, *Cunningham* ... F C S W M A N Y L .
circinata, *Bentham* ... ... M
phyllodinea, *R. Brown*... ... F C S W M A N T

Petalostylis, R. Brown (1849).

labicheoides, *R. Brown* ... F C S

Bauhinia, Linne.

Leichhardtii, *F. v. Mueller* ... F
Carronii, *F. v. Mueller*... C

Neptunia, Loureiro (1790).

monosperma, *F. v. Mueller* ... F
gracilis, *F. v. Mueller* ... ... F

Acacia, Willdenow.

	F	C	S	W	M	A	N	Y	L	K	T	G
continua, *Bentham*				W	.	A	N					
Peuce, *F. v. Mueller*		C										
spinescens, *Bentham*					M	A	.	Y	L	K		
colletioides, *Cunningham*				W	M							
genistioides, *Cunningham*				W								
rupicola, *F. v. Mueller*						A	N	.	L	K		
tetragonophylla, *F. v. Mueller*	F	C	S	W	M							
spondylophylla, *F. v. Mueller*	F											
lycopodifolia, *Cunningham*	F											
minutifolia, *F. v. Mueller*	F											
calamifolia, *Sweet*			S	W	M	A	N			K		
scirpifolia, *Meissner*	F			W								
juncifolia, *Bentham*	F											
rigens, *Cunningham*						A	.	Y	L	.	T	
gonophylla, *Bentham*				W								
sessiliceps, *F. v. Mueller*	F											
papyrocarpa, *Bentham*				W								
Gilesiana, *F. v. Mueller*				W								
armata, *R. Brown*					M	A	N		L	K	T	
strongylophylla, *F. v. Mueller*	F											
Sentis, *F. v. Mueller*	F	C	S									
aspera, *Lindley*					M							
acanthoclada, *F. v. Mueller*				W								
vomeriformis, *Cunningham*						A					T	
erinacea, *Bentham*				W								
obliqua, *Cunningham*					M	A	N					
lineata, *Cunningham*									L			
sublanata, *Bentham*			S	W			N					
pravifolia, *F. v. Mueller*			S				N					
acinacea, *Lindley*						A	N	Y	L			
anceps, *DeCandolle*									L			
dodonaeifolia, *Willdenow*									L	K	T	.
microcarpa, *F. v. Mueller*					M	.	.	Y	L	K		
brachybotrya, *Bentham*					M	A	N	Y	.	K	T	
Spilleriana, *J. E. Brown*						A						
suaveolens, *Willdenow*												G
iteaphylla, *F. v. Mueller*			S									
Murrayana, *F. v. Mueller*		C										
notabilis, *F. v. Mueller*				W	M	A	N	Y	L	K		
retinodes, *Schlechtendal*						A	N		L	K		G
Wattsiana, *F. v. Mueller*							N					
pycnantha, *Bentham*			S			A	N		L	K		G
hakeoides, *Cunningham*			S		M			Y				
salicina, *Lindley*	F	.		W	M	A	N	Y	L	K		
pyrifolia, *DeCandolle*	F											
myrtifolia, *Willdenow*						A			L	K	T	G
verniciflua, *Cunningham*						A						
montana, *Bentham*					M	A					T	
impressa, *F. v. Mueller*	F											
estrophiolata, *F. v. Mueller*	F											
craspedocarpa, *F. v. Mueller*		C										
cochlearis, *Wendland*				W					L			
dictyophleba, *F. v. Mueller*	F											
retivenea, *F. v. Mueller*	F											
trineura, *F. v. Mueller*					M							
cyclopis, *Cunningham*				W								

melanoxylon, *R. Brown*	...	...	...	...	A	N				T	G
homalophylla, *Cunningham*	...	...	S	W	M						
stenophylla, *Cunningham*	...	C			M						
Osswaldi, *F. v. Mueller*	...	C		W	M	.		Y			
coriacea, *DeCandolle* ...	...	C									
sclerophylla, *Lindley* ...	...	...		...	M			Y	L		T		
farinosa, *Lindley* ...	...	...		...	M					K			
Whanii, *F. v. Mueller* ...	...	...		...	M					K			
lanigera, *Cunningham* ...	...	...		...	...		...	Y					
verticillata, *Willdenow*...	...	...		...	...	A	N			K	.	G	
oxycedrus, *Sieber* ...	...	...		...	...		...		...		...	G	
rhigiophylla, *F. v. Mueller*	...	...		...	M								
stipuligera, *F. v. Mueller*	...	F											
lysiphloia, *F. v. Mueller*	...	F											
longifolia, *Willdenow* ...	...	...		...	...	A	.	Y	L	K	T	G	
Kempeana, *F. v. Mueller*	...	F											
acradenia, *F. v. Mueller*	...	F											
doratoxylon, *Cunningham*	...	F	C										
aneura, *F. v. Mueller* ...	...	F	C	S	W								
cibaria, *F. v. Mueller* ...	...	F											
cyperophylla, *F. v. Mueller*	...	F	C		.			.					
Burkitti, *F. v. Mueller* ...	...		...	.	W								
Farnesiana, *Willdenow* ...	...	F	C										
Mitchelli, *Bentham* ...	...		.									G	
mollissima, *Willdenow* ...	...		...	...	...		...		...		T	G	
dealbata, *Link*	...		...	...	...		...		...		T	G	

THYMELEAE.

Pimelea, Banks & Solander (1788).

trichostachya, *Lindley* ...	....	F	C											
curviflora, *R. Brown* ...	...		...		W	M	A	N	Y		K			
simplex, *F. v. Mueller* ...	...	F	C	S	W									
phylicoides, *Meissner* ...	...		...		W		A		Y		K		G	
octophylla, *R. Brown* ...	...		...		...	M	A	N	Y	L	K		G	
petraea, *Meissner* ...	...		...	S	W									
glauca, *R. Brown* ...	...		...		...	M	A	N	Y	L	K	T	G	
ligustrina, *Labillardiere*	...		...		...	...	A				K		G	
stricta, *Meissner* ...	...		...		...	...	A				K			
spathulata, *Labillardiere*	...		...		...	...	A	N			K			
humilis, *R. Brown* ...	...		...		...	...	A					T	G	
microcephala, *R. Brown*	...	F	C	S	W	M				L	K			
serpyllifolia, *R. Brown*	...		...		...	M	A		Y	L	K	.	G	
elachantha, *F. v. Mueller*	...		..		...	...		...		...		T	G	
flava, *R. Brown*	...		...		...	M	A			L	K			
petrophila, *F. v. Mueller*	...		...	S				N						
ammocharis, *F. v. Mueller*	...	F												

PROTEACEAE.

Petrophila, R. Brown (1809).

multisecta, *F. v. Mueller*	...	...	...	...	...	...	K							

Isopogon, R. Brown (1809).

ceratophyllus, *R. Brown*	...	...	...	...	A					K	T	G		

Adenanthos, Labillardiere (1804).

sericea, *Labillardiere*										K		
terminalis, *R. Brown*						A			L	K		G

Conospermum, Smith (1798).

patens, *Schlechtendal*						A			L	K	T	G
Mitchellii, *Meissner*												G

Persoonia, Smith (1798).

juniperina, *Labillardiere*						A					T	

Grevillea, R. Brown (1809).

Huegelii, *Meissner*				W	M	A	N	Y	L			G
Treueriana, *F. v. Mueller*	F			W								
ilicifolia, *R. Brown*					M	A	N	Y	L	K	T	
aquifolium, *Lindley*											T	
angulata, *R. Brown*	F											
Wickhami, *Meissner*	F											
agrifolia, *Cunningham*	F											
pterosperma, *F. v. Mueller*	F	C		W	M							
stenobotrya, *F. v. Mueller*	F											
juncifolia, *Hooker*	F	C		W								
halmaturina, *Tate*									L	K		G
nematophylla, *F. v. Mueller*		C	S	W								
striata, *R. Brown*	F	C										
lavandulacea, *Schlechtendal*						A	N		L	K	T	G
aspera, *R. Brown*				W					L	K		
pauciflora *R. Brown*									L	K		

Hakea, Schrader (1797).

chordophylla, *F. v. Mueller*	F											
lorea, *R. Brown*	F											
macrocarpa, *Cunningham*	F											
multilineata, *Meissner*	F			W								
Baxteri, *R. Brown*				W								
Ednieana, *Tate*			S									
purpurea, *Hooker*	F				M							
vittata, *R. Brown*						A			L		T	
nodosa, *R. Brown*												G
cycloptera, *R. Brown*									L			
leucoptera, *R. Brown*	F	C	S		M			Y				
rostrata, *F. v. Mueller*						A				K		G
rugosa, *R. Brown*						A	N	Y	L	K	T	G
ulicina, *R. Brown*						A		Y		K	T	G
nitida, *R. Brown*				W								

Banksia, Linne fils (1781).

marginata, *Cavanilles*						A	N		L	K	T	G
ornata, *F. v. Mueller*						A				K	T	G

SAXIFRAGEAE.

Bauera, Banks (1793).

rubioides, *Andrews*						A				K		

CRASSULACEAE.

Tillaea, Linne.

verticillaris, *De Candolle* ... C S W M A N Y L K T G
purpurata, *Hooker* ... ...A N Y G
recurva, *Hooker*... ... ... M A K G
macrantha, *Hook.* ... ... M A Y L K G

ROSACEAE.

Geum, Linne (1737).

urbanum, *Linne* ... ... G

Potentilla, Linne (1737).

anserina, *Linne* ... ... A G

Rubus, Linne.

parvifolius, *Linne* ... ... A K G

Acaena, Linne (1771).

ovina, *Cunningham* ... ... A N Y L K T G
Sanguisorbae, *Vahl* ... ... A K G

Stylobasium, Desfontaines (1819).

spathulatum, *Desfontaines* ... F

FICOIDEAE.

Mesembrianthemum, Linne (1737).

aequilaterale, *Haworth* ... F . S W M A N Y L K T G
australe, *Solander* ... ... W M A N Y L K T

Tetragonia, Linne (1737).

expansa, *Murray* ... ... C S W M N
implexicoma, *Hook.* ... ...A N Y L K T G

Gunnia, F. v. Mueller (1858).

septifraga, *F. v. Mueller* ... C

Aizoon, Linne (1737).

quadrifidum, *F. v. Mueller* ... C S W
zygophylloides, *F. v. Mueller*... C S

Trianthema, Linne.

turgidifolia, *F. v. Mueller* ... F
crystallina, *Vahl* ... ... C S M
pilosa, *F. v. Mueller* ... ... F C
humillima, *F. v. Mueller* ... ... Y

Zaleya, Burmann (1768).

decandra, *Burmann* ... ... C W

Mollugo, Linne (1737).

hirta, *Thunberg*	F	C	S		M							
orygioides, *F. v. Mueller*		C										
Spergula, *Linne*					M							
Cerviana, *Seringe*	F			W	M							

LYTHRARIEAE.

Lythrum, Linne (1737).

Salicaria, *Linne*						A						G
hyssopifolia, *Linne*	F	C				A						G

Rotala, Linne (1771).

diandra, *F v. Mueller*	F											
verticillaris, *Linne*	F											

Ammannia, Linne (1737).

baccifera, *Linne*		C										
multiflora, *Roxburgh*	F				M							

ONAGREAE.

Epilobium, Linne (1737).

glabellum, *G. Forster*			S			A	N		L	K		G

Jussieua, Linne (1737).

diffusa, *Forskael*					M	A						G

MYRTACEAE.

Darwinia, Rudge (1813).

micropetala, *Bentham*				W						K		
Schuermanni, *Bentham*									L			

Verticordia, DeCandolle (1813).

Wilhelmii, *F. v. Mueller*									L			

Calycothrix, Labillardiere (1806).

longiflora, *F. v. Mueller*	F											
tetragona, *Labillardiere*						A	N	Y	L	K	T	G

Lhotzkya, Schauer (1835).

glaberrima, *F. v. Mueller*										K		
genetylloides, *F. v. Mueller*											T	G
Smeatoniana, *F. v. Mueller*										K		

Thryptomene, Endlicher (1838).

Maisonneuvii, *F. v. Mueller*	F											
flaviflora, *F. v. Mueller*	F											
Mitchelliana, *F. v. Mueller*					M						T	
auriculata, *F. v. Mueller*				W								
Elliottii, *F. v. Mueller*				W								
ericaea, *F. v. Mueller*										K		
Miqueliana, *F. v. Mueller*								Y	L			
ciliata, *F. v. Mueller*										K	T	G

Baeckea, Linne (1753).

diffusa, *Sieber*						A					K			
crassifolia, *Lindley*								Y	L	K	T	G		
ericaea, *F. v. Mueller*									...		T			
polystemona, *F. v. Mueller* ...		F												
Behrii, *F. v. Mueller*				W					L		T			

Leptospermum, R. & G. Forster (1776).

laevigatum, *F. v. Mueller*			W	M				Y		K	T			
scoparium, *Forster*					...	A	N			K		G		
lanigerum, *Smith*					...	A				K		G		
myrsinoides, *Schlechtendal*					...	A				K	T	G		

Kunzea, Reichenbach (1828).

pomifera, *F. v. Mueller*					...	A				K	T	G		

Callistemon, R. Brown (1814).

coccineus, *F. v. Mueller*					...	A	N	Y	L	K	T	G		
salignus, *DeCandolle*					...	A					T			
teretifolius, *F. v. Mueller*			S			A								
brachyandrus, *Lindley*...				M							T			

Melaleuca, Linne (1767).

squamea, *Labillardiere*...					...			...	K		G			
Wilsonii, *F. v Mueller*					...			L		T	G			
gibbosa, *Labillardiere*					...			...	K		G			
decussata, *R. Brown*					...	A			L	K	T	G		
squarrosa, *Smith*					...			...	K	T	G			
glomerata, *F. v. Mueller* ...	F	C	S											
trichostachya, *Lindley*... ...		C												
parviflora, *Lindley*	F		S	W	M	A	N	Y	L	K	T	G		
cylindrica, *R. Brown*			...		...		...		...	K				
acuminata, *F. v. Mueller*			...		M	A		Y	L	K	T			
quadrifaria, *F. v. Mueller*			W											
uncinata, *R. Brown*			W		M	A	N	Y	L	K	T			
ericifolia, *Smith*			...		...		...		...		...	G		
pustulata, *Hooker*			...		...	A		Y	L	K	T	G		

Eucalyptus, L'Heritier (1788).

corynocalyx, *F. v. Mueller*			...		...		N		L	K				
gamophylla, *F. v. Mueller* ...	F													
tessellaris, *F. v. Mueller* ...	F													
incrassata, *Labillardiere*		S	W	M	A	N	Y	L	K	T	G			
hemiphloia, *F. v. Mueller*			...		...		N		L	K	T			
gracilis, *F. v. Mueller*			...	M	A	N	Y			K	T			
odorata, *F. v. Mueller*			...		...	A	N	Y		K	T	G		
pauciflora, *Sieber*			...		...		...		...		...	G		
amygdalina, *Labillardiere*			...		...		...		...		...	G		
obliqua, *L'Heritier*			...		...	A				K		G		
Sieberiana, *F. v. Mueller*			...		...		...		...	K		G		
paniculata, *Smith*			...		...	A				K		G		
largiflorens, *F. v. Mueller*			...	M						K	T			
Behriana, *F. v. Mueller*			...		...		N		L	K	T			
oleosa, *F. v. Mueller*			S				N	Y			T			
terminalis, *F. v. Mueller* ...	F													
setosa, *Schauer*	F													

goniocalyx, *F. v. Mueller*	...	...	...	...	A	N			K					
leucoxylon, *F. v. Mueller*	...	...	...	...	A	N		L	K	T	G			
uncinata, *Turczaninow* ...	...	...	...	M	A		Y		K	T				
cneorifolia, *DeCandolle* ...	...	...	...	...		...		L	K					
microtheca, *F. v. Mueller*	...	F	C											
Stuartiana, *F. v. Mueller*	...	...	...	...		...		...		...	G			
viminalis, *Labillardiere*	...	...	...	...	A			L	K		G			
rostrata, *Schlechtendal* ...	...	F	C	S	W	M	A	N		L	K	T	G	
Gunnii, *Hooker*	...	...	...	...	A						G			
cosmophylla, *F. v. Mueller*	...	...	...	...	A			L	K					
santalifolia, *F. v. Mueller*	...	...	...	...	A			L	K		G			
capitellata, *Smith* ...	...	...	...	...	A				K	T	G			
macrorrhyncha, *F. v. Mueller* ...	...	...	...	...	A									
Oldfieldii, *F. v. Mueller*	...	F												
pachyphylla, *F. v. Mueller*	...	F												
pyriformis, *Turczaninow*	...	F		W										

RHAMNACEAE.

Ventilago, Gaertner (1788).

viminalis. *Hooker*	...	...	F											

Pomaderris, Labillardiere (1804).

myrtilloides, *Fenzl*	...	...		W										
apetala, *Labillardiere* ..	...	...	...	...		N					G			
racemosa, *Hooker*	...	...	...	...	A	N	Y	L	K		G			
obcordata, *Fenzl* ...	...	...	...	...		N	Y	L	K		G			

Cryptandra, Smith (1798).

Wayii, *F. v. Mueller & Tate* ...	...	...	...	A	N									
Hookeri, *F. v. Mueller* ...	...	...	...	A						G				
phlebophylla, *F. v. Mueller*	...	...	S											
spathulata, *F. v. Mueller*	...	F			A			L	K		G			
coactilifolia, *F. v. Mueller*	...	...	...	...	A									
leucophracta, *Schlechtendal*	...	...	W	M			Y	L	K					
obovata, *Hooker* ...	...	...	...	...	A				K					
vexillifera, *Hooker* ...	...	...	...	...	A		Y	L	K	T	G			
subochreata, *F. v. Mueller*	...	...	...	M	A			L		T	G			
halmaturina, *F. v. Mueller*	...	...	...	...	A				K					
bifida, *F. v. Mueller* ...	...	...	...	...		...		L						
scabrida, *Tate*	...	...	...	...		...		...	K					
Waterhousei, *F. v. Mueller*	...	...	...	...		...		...	K					
hispidula, *Reisseck* ...	...	...	...	...	A				K	T				
propinqua, *Cunningham*	...	...	...	M										
amara, *Smith*	...	...	W		A									
tomentosa, *Lindley* ...	...	...	W	M	A		Y	L						

OLACINEAE.

Olax, Linne (1747).

Benthamiana, *Miquel* ...	...	...	...	...		...		L	K					

SANTALACEAE.

Santalum, Linne (1742).

lanceolatum, *R. Brown* ...	...	F	C	S										
acuminatum, *DeCandolle*	...	F		S	W	M	A	N	Y	L	K			
persicarium, *F. v. Mueller*	...	...		S		M	A	N	Y			T		

Choretrum, R. Brown (1810).

glomeratum, *R. Brown*...	...	...	...	...	A				Y	L	K	T				
chrysanthum, *F. v. Mueller*	...	...	...	...	A				Y							
spicatum, *F. v. Mueller*	...	...	...	M							K	T				

Leptomeria, R. Brown (1810).

aphylla, *R. Brown*	...	...	...	...	M	A	N			L	K					G

Anthobolus, R. Brown (1810).

exocarpoides, *F. v. Mueller*	...	F														

Exocarpos, Labillardiere (1798).

cupressiformis, *Labillardiere*	...	...	...	M	A				Y	L	K	T	G			
spartea, *R. Brown*	...	...	F		M	A			Y	L						
aphylla, *R. Brown*	...	...	...	S	W	M	A	N	Y	L						
stricta, *R. Brown*	...	...	...	...		M				L		T	G			

HALORAGEAE.

Loudonia, Lindley (1839).

Behrii, *Schlechtendal*	...	...	...	...	A				Y	L	K	T				
aurea, *Lindley* ...	...	...	...	S	W						K					

Haloragis, R. & G. Forster (1776).

Meionectes, *F. v. Mueller*	...	...	...	...	A											G
heterophylla, *Brongniart*	...	C	S	M	A	N	Y	L								G
digyna, *Labillardiere* ...	...	...	W	M	A					K						G
elata, *Cunningham*	...	...	W		A					K						
aspera, *Lindley* ...	...	F	C	S	W	M	A	N	Y							G
acutangula, *F. v. Mueller*	...	...	...	...		...		L								
odontocarpa, *F. v. Mueller*	...	...	W	M												
trigonocarpa, *F. v. Mueller*	...	F														
Gossei, *F. v. Mueller* ...	...	F														
micrantha, *R. Brown* ...	...	...	..	...	A											G
tetragyna, *R. Brown* ...	...	...	...	...	A	N	Y	L	K	T	G					
teucrioides, *A. Gray* ...	...	...	...	...	A	N	Y	L	K		G					

Myriophyllum, Linne (1767).

integrifolium, *Hooker* ...	...	...	...	M	A						T	G				
amphibium, *Labillardiere*	...	...	...	...	A							G				
pedunculatum, *Hooker*...	...	...	...	...		...		...		...		G				
verrucosum, *Lindley* ...	...	F		M	A			L				G				
Muelleri, *Sonder* ...	...	...	...	...	A			L	K							
intermedium, *DeCandolle*	...	...	...	M	A				K			G				
elatinoides, *Gaudichaud*	...	...	...	M	A				K	T	G					

Callitriche, Linne (1748).

verna, *Linne*	...	...	...	...	...	M	A				T					

UMBELLIFERAE.

Actinotus, Labillardiere (1804).

Schwarzii, *F. v. Mueller*	...	F														

Hydrocotyle, Linne.

vulgaris, *Linne*				S		M	A	N				T	G
Asiatica, *Linne*				S		M	A				K		G
Candollei, *F. v. Mueller*				S			A	N			K	T	G
hirta, *R. Brown*...						...	A			L	K		G
pterocarpa, *F. v. Mueller*				...		...	...	...		...	...	...	G
comocarpa, *F. v. Mueller*				...		...	...	...		...	K		
tripartita, *R. Brown*				...		...	...	...		...	K		G
callicarpa, *Bunge*				S		M	A	N	Y	L	K	T	G
trachycarpa, *F. v. Mueller* ...		F		S									
crassiuscula, *Tate*				...		...	...	...		...	K		
capillaris, *F. v. Mueller*				W			A		Y	L	K		G
medicaginoides, *Turcz.*				...		...	...	...	Y				
diantha, *DeCandolle*				...		...	...	...		...	K		

Didiscus, DeCandolle (1828).

pusillus, *F. v. Mueller*				...		...	A		Y	L	K		
cyanopetalus, *F. v. Mueller* ...		F				M			Y	L			
eriocarpus, *F. v. Mueller*				S	W				Y	L			
pilosus, *Bentham*				...		...	...	...		...		...	G
glaucifolius, *F. v. Mueller* ...		F	C	S									

Trachymene, Rudge (1810).

heterophylla, *F. v. Mueller*						...	A			L	K		

Xanthosia, Rudge (1810).

pusilla, *Bunge*						...	A		Y				
dissecta, *Hooker*						...	A			L	K	T	G

Eryngium, Linne.

rostratum, *Cavan.*						...	A					T	G
vesiculosum, *Labillardiere*						...	A				K		G
plantagineum, *F. v. Mueller* ...			C										

Crantzia, Nuttall (1818).

lineata, *Nuttall*						M	A				K		G

Caldasia, Lagasca (1821).

andicola, *Lagasca*												...	G

Apium, Linne.

prostratum, *Labillardiere*						M	A	N	Y	L	K	T	G

Sium, Linne.

latifolium, *Linne*						...	A						

Daucus, Linne.

brachiatus, *Sieber*	F	C	S	W	M	A	N	Y	L	K	T	G

CUCURBITACEAE.

Cucumis, Linne.

Chate, *Linne*	F			...	M								

Momordica, Linne.

Charantia, *Linne* ... ... F

Melothria, Linne.

Muelleri, *Bentham* ... ... M
Maderaspatana, *Cogniaux* ... F S

LORANTHACEAE.

Loranthus, Linne (1740).

celastroides, *Sieber* ... ... G
angustifolius, *R. Brown* L
Exocarpi, *Behr* ... ... F C S W A Y
linearifolius, *Hooker* ... ... S
Murrayi, *Tate* ... ... S
linophyllus, *Fenzl* ... ... F C W M A Y
gibberulus, *Tate* ... ... F C
pendulus, *Sieber*... ... ... F C W A Y L G
Quandang, *Lindley* ... ... F C S
grandibracteus, *F. v. Mueller*... C

Viscum, Linne.

articulatum, *Burm.* C

RUBIACEAE.

Oldenlandia, Linne.

tillaeacea, *F. v. Mueller* ... F C S

Dentella, Forster (1776).

repens, *Forster* ... ... F C

Canthium, Lamarck (1783).

latifolium, *F. v. Mueller* ... F

Coprosma, Forster (1776).

hirtella, *Labillardiere* ... ... G

Opercularia, Gaertner (1788).

ovata, *J. Hooker* ... ... A G
varia, *J. Hooker* ... ... A Y K G
scabrida, *Schlechtendal*... ... ... A L

Pomax, Solander (1788).

umbellata, *Solander* ... ... F S W N

Spermacoce, Linne.

marginata, *Bentham* ... ... F

Asperula, Linne.

geminifolia, *F. v. Mueller* ... ... M T
oligantha, *F. v. Mueller* ... ... S M A N Y K T G

Galium, Linne.

umbrosum, *Solander* ... ... W M A N Y L K T G
australe, *DeCandolle* ... ... S M A N Y K T G

CAPRIFOLIACEAE.

Sambucus, Linne.

Gaudichaudiana, *DeCandolle* ... ... G

COMPOSITAE.

Siegesbeckia, Linne (1737).

orientalis, *Linne* ... ... F W A N G

Wedelia, Jacquin (1763).

platyglossa, *F. v. Mueller* ... C M A T
verbesinoides, *F. v. Mueller* ... F

Bidens, Linne (1753).

bipinnata, *Linne* ... ... F

Glossogyne, Cassini (1827).

tenuifolia, *Cassini* ... ... F S

Flaveria, Jussieu (1789).

Australasica, *Hooker* C

Aster, Linne.

Sonderi, *F. v. Mueller* ...	...	...	...	...	A							
pannosus, *F. v. Mueller*	...	...	...	...	A	N	Y	L		T	G
pimeloides, *Cunningham*	...	...	S	W	M		N					
myrsinoides, *Labillardiere*	...	...	...	...		...		..		...	G
Mitchelli, *F. v. Mueller*	...	F			M			Y				
tubuliflorus, *F. v. Mueller*	...	...	...	...	A				K	T		
axillaris, *F. v. Mueller*...	...	...	...	...	A	N	Y	L	K	T	G
microphyllus, *Ventenat*	...	...	...	...		...		...		...	G
ramulosus, *Labillardiere*	...	...	W	M	A		Y	L	K		G
exiguifolius, *F. v. Mueller*	...	...	W								
lepidophyllus, *Persoon*...	...	...	...	..	A		Y			T	
stellulatus, *Labillardiere*	...	...	...	...		...		...		...	G
asterotrichus, *F. v. Mueller*	...	...	...	...		...		...		...	G
magniflorus, *F. v. Mueller*	...	...	W	M							
calcareus, *F. v. Mueller*	...	...	S	W	M						
Muelleri, *Sonder* ...	...	C		W	M			Y			T	
Stuartii, *F. v. Mueller* ...	...	...		W							
decurrens, *Cunningham*	...	...	...		M			Y	L			
glutescens, *F. v. Mueller*	...	...	S		M	A		Y			T	G
teretifolius, *F. v. Mueller*	...	...		...	M	A		Y		K		G
glandulosus, *Labillardiere*	...											G
megalodontus, *F. v. Mueller*	...	F										
Ferresii, *F. v. Mueller* ...	...	F										
exul, *Lindley*	...	...		W	M	A	N	Y	L	K		G
Huegelii, *F. v. Mueller*	...	...		W		A		Y	L	K	T	G

Podocoma, Cassini (1817).

cuncifolia, *R. Brown* ... ... F C S

Vittadinia, Richard (1832).

australis, *Richard* ... ... F S W M A N Y L K T G

Dimorphocoma, F. v. Mueller & Tate (1883).

minutula, *F. v. Mueller & Tate*			S										

Minuria, DeCandolle (1836).

leptophylla, *DeCandolle*	...	F	C	S	W	M	A	N	Y	L		T	
Cunninghamii, *Bentham*	...	F	C	S		M			Y				
integerrima, *Bentham* ...	...		C	S		M							
denticulata, *Bentham* ...	...	F	C	S		M							
suaedifolia, *F. v. Mueller*	...		C		W			N	Y	L		T	

Aehnophora, F. v. Mueller (1883).

Tatei, *F. v. Mueller*	...	...	...	...	...	...	...	K					

Calotis, R. Brown (1820).

cuneifolia, *R. Brown*	...	...	...	...	M	A	N						
hispidula, *F. v. Mueller*	...	F	C	S	W	M		N	Y				
cymbacantha, *F. v. Mueller*	...	F	C	S	W			N					
erinacea, *Steetz* ...	...	...	C	S		M	A		Y	L			
scabiosifolia, *Sonder & F. v. M.*		...	S				A						
scapigera, *Hooker*	...	...	...		...	M							
lappulacea, *Bentham*	...	...	F	C	S								
microcephala, *Bentham*...		...	F										
plumulifera, *F. v. Mueller*		...		C	S								
porphyroglossa, *F. v. Mueller*...		F	C										
Kempei, *F. v. Mueller* ...		...	F										

Lagenophora, Cassini (1818).

Billardieri, *Cassini*	...	...	...	...	...	A				L	K		G
Huegelii, *Bentham*	...	...	...	...	...	A	N	Y	L				G

Brachycome, Cassini (1816).

goniocarpa, *Sonder & F. v. M.*		...	...	M		N		L					
pachyptera, *Turczaninow*	...	C	S	W	M	A	N	Y					
collina, *Bentham*	...	...	...	...	...	A	N	Y	L				
Muelleri, *Sonder*	...	...	...	...	...	A			L		T		G
graminea, *F. v. Mueller*		...	...	W	M	A							G
basaltica, *F. v. Mueller*		...	...	...	...	A							
trachycarpa, *F. v. Mueller*		...	S	W		A	N						G
diversifolia, *Fischer & Meyer* ...		...	...	...	...	A							G
ciliaris, *Lessing* ...	...	...	F	C	S	W	M	A	N	Y	L		T	
debilis, *Sonder* ...	...	...	...	...	...	...	A				L		
chrysoglossa, *F. v. Mueller*		...	...	...	M								
calocarpa, *F. v. Mueller*		...	...	S		M	A						
exilis, *Sonder* ...	...	...	...	...	...	M	A	N		L			
melanocarpa, *Sonder & F. v. M.*			C		W	M							
cardiocarpa, *F. v. Mueller*		...	...	...	...	...	...	...	...	...		...	G
cuneifolia, *Tate* ...	...	...	...	...	...	...	...	...	L	K			
decipiens, *Hooker*	...	...	...	...	...	...	...	...	...		...	G	

Erodiophyllum, F. v. Mueller (1875).

Elderi, *F. v. Mueller*	...	...	C		W								

Cymbonotus, Cassini (1825).

Lawsonianus, *Gaudichaud*	...	...	...	...	A	N	Y	L	K		G		

Solenogyne, Cassini.

emphysopus, *F. v. Mueller*						A						K	T	G

Isoetopsis, Turczaninow (1851).

graminifolia, *Turczaninow*				S		M	A	N	Y	L	K	T		

Toxanthus, Turczaninow (1851).

perpusillus, *Turczaninow*						M		N	Y					
Muelleri, *Bentham*						M	A			L	K			

Quinetia, Cassini (1830).

Urvillei, *Cassini*							A			L				

Millotia, Cassini (1829).

tenuifolia, *Cassini*				S	W	M	A	N	Y	L	K	T	G	
Greevesii, *F. v. Mueller* ...			C	S		M								
Kempei, *F. v. Mueller*		F		S	W									

Erechthites, Rafinesque (1817).

prenanthoides, *DeCandolle*								...		...			...	G
picridioides, *Turczaninow* ...	F							N	Y		K	T		
arguta, *DeCandolle*				S			A				K	T	G	
mixta, *DeCandolle*						M				L				
quadridentata, *DeCandolle*						M	A	N	Y	L	K		G	
hispidula, *DeCandolle*						M	A		Y	L		T	G	

Senecio, Linne.

Gregorii, *F. v. Mueller*... ...	F	C	S	W	M									
platylepis, *DeCandolle*...					M									
spathulatus, *Richard*								...		...			...	G
megaglossus, *F. v. Mueller*								N						
magnificus, *F. v. Mueller* ...	F			S										
lautus, *Solander*...	F	C	S	W	M	A	N	Y	L	K		G		
Behrianus, *Sonder & F. v.M.*					M									
dryadeus, *Sieber*...							...		...		...	G		
anethifolius, *Cunningham*	S						N							
odoratus, *Hornemann*	F					A	N		L	K		G		
hypoleucus, *Bentham*						A								
Cunninghamii, *DeCandolle* ...	C	S	W	M	A	N	Y		K					
Georgianus, *DeCandolle*					A				K					
brachyglossus, *F. v. Mueller* ...	C	S	W	M	A	N	Y							

Cotula, Linne (1735).

filifolia, *Thunberg*					M	A	N		L	K	T	G		
coronopifolia, *Linne*	C	S			M	A	N		L	K	T	G		
australis, *Hooker*					M	A	N		L	K	T	G		
reptans, *Bentham*							...		...		...	G		

Centipeda, Loureiro (1790).

orbicularis, *Loureiro*			C		M									
Cunninghamii, *F. v. Mueller* ...	F	C			M	A	N	Y	L	K	T	G		
thespidioides, *F. v. Mueller* ...	F	C	S		M									

Ceratogyne, Turczaninow (1851).

obionoides, *Turczaninow*			S											

Ethuliopsis, F. v. Mueller (1861).

Cunninghamii, *F. v. Mueller* ... C S M

Epaltes, Cassini (1818).

australis, *Lessing* ... ... F C M
Tatei, *F. v. Mueller* ... ... L T

Stuartina, Sonder (1852).

Muelleri, *Sonder* ... ... S M A N Y L K T G

Humea, Smith (1804).

squamata, *F. v. Mueller* ... ... M T
cassiniacea, *F. v. Mueller* L

Ixodia, R. Brown (1812).

achilleoides, *R. Brown* ... ...A L K G

Elachanthus, F. v. Mueller (1852).

pusillus, *F. v. Mueller* ... ... S W M Y

Rutidosis, DeCandolle (1837).

helichrysoides, *DeCandolle* ... F C S
Pumilo, *Bentham* ... ...A Y L F

Pluchea, Cassini (1817),

conocephala, *F. v. Mueller* ... ... W M N
tetranthera, *F. v. Mueller* ... F
Eyrea, *F. v. Mueller* ... ... F C S N

Pterigeron, DeCandolle (1836).

liatroides, *Bentham* ... ... C S W
microglossus, *Bentham*... ... F
adscendens, *Bentham* ... ... F
dentatifolius, *F. v. Mueller* ... F

Podosperma, Labillardiere (1806).

angustifolium, *Labillardiere* ... ... M A N Y L K T G

Ixiolaena, Bentham (1837).

leptolepis, *Bentham* ... ... C S M
supina, *F. v. Mueller* ... ...A L K
tomentosa, *Sonder & F. v. M.*... F C W S M N L

Athrixia, Ker (1823).

tenella, *Bentham* ... ... S M N Y L T

Cassinia, R. Brown (1817).

aculeata, *R. Brown* ... ... M Y G
arcuata, *R. Brown* ... ... M A Y
laevis, *R. Brown* ... ... S W
punctulata, *F. v. M. & Tate* ... ... N Y L K T
spectabilis, *R. Brown*... ... ... Y K

Podolepis, Labillardiere (1806).

rutidochlamys, *F. v. Mueller* ...		C											
canescens, *Cunningham* ...	F	C	S	W	M	A	N	Y	L		T		
acuminata, *R. Brown*		...		...	...	A		Y					G
rugata, *Labillardiere*		...		...	...	A		Y	L	K	T		G
Lessoni, *Bentham*		...	S			A							
Siemssenia, *F. v. Mueller* ...		C	S	W	M		N						

Gnaphalium, Linne (1737).

luteo-album, *Linne*	F	C	S		M	A	N	Y	L	K	T	G
Indicum, *Linne*	F											
Japonicum, *Thunberg*	F		S		M	A	N	Y	L	K	T	G
indutum, *Hooker*		...		...	M	A	N	Y	L	K		G

Leptorrhynchos, Lessing (1832).

tenuifolius, *F. v. Mueller* ...	...		...		...		...		...		G
squamatus, *Lessing*	...	S		M	A	N	Y	L		T	G
pulchellus, *F. v. Mueller* ...	C		W	M	A	N	Y	L		T	G
elongatus, *DeCandolle*	...		...	...	A	N	Y			T	G
medius, *Cunningham*	...		...	M	A	N	Y	L		T	G
Waitzia, *Sonder*...	...		W	M	A	N	Y	L			

Helipterum, DeCandolle (1837).

roseum, *Bentham*	...		W								
anthemoides, *DeCandolle* ...	...		...	...	A	N				T	
polygalifolium, *DeCandolle* ...	...	S	W	M				L			
strictum, *Bentham*	C	S	W								
hyalospermum, *F. v. Mueller* ...	C	S	W	M	A	N	Y	L			
floribundum, *DeCandolle* ...	F C	S	W	M		N	Y				
heteranthum, *Turczaninow* ...	...		...	...		...	Y				
tenellum, *Turczaninow*... ...	...		W								
pygmaeum, *Bentham*	...	S	W	M	A	N	Y	L			
corymbiflorum, *Schlechtendal* ...	C	S	W	M	A	N	Y				
stipitatum, *F. v. Mueller* ...	F										
incanum, *DeCandolle*	F C	S		M		N					
Cotula, *DeCandolle*	...		W	M							
Haigii, *F. v. Mueller*	...		W								
laeve, *Bentham*	...	S									
dimorpholepis, *Bentham* ...	...		...	...	A	N	Y		K	T	
exiguum, *F. v. Mueller*... ...	C		W	M	A	N	Y		K	T	G
moschatum, *Bentham*	F C	S	W	M	A	N				T	
pterochaetum, *Bentham* ...	F C	S	W								
Tietkensii, *F. v. Mueller* ...	F		W			N					
Charsleyae, *F. v. Mueller* ...	F										

Waitzia, Wendland (1808).

corymbosa, *Wendland*	...		W	M	A	N

Helichrysum, Vaillant (1719).

Cassinianum, *Gaudichaud* ...	F	C		W									
Ayersii, *F. v. Mueller*	F												
Lawrencella, *F. v Mueller* ...	F	C		W									
semifertile, *F. v. Mueller* ...	F	C	S	W									
scorpioides, *Labillardiere* ...	...		...		...	A					T	G	
rutidolepis, *DeCandolle* ...	F					A							
lucidum, *Henckel*	F			W	M	A	N	Y	L	K		G	
podolepideum, *F. v. Mueller*		C	S										

obtusifolium, *Son. & F. v. M.*	...	...	...	...	A		Y	L	K		G
Blandowskianum, *Steetz*	...	...	...	...	...	A								G
adenophorum, *F. v. Mueller*	...	...	...	...	...	...	...	...	K	T	
leucopsidium, *DeCandolle*	...	...	...	...	A	N	Y	L	K		G
Baxteri, *F. v. Mueller* ...	...	...	...	...	A		Y	L		T	G
ambiguum, *Turczaninow*	...	F	S		A						
Tepperi, *F. v. Mueller* ...	...	...	...	...	A		Y				
apiculatum, *DeCandolle*	...	F	C	S	W	M	A	N	Y	L	K	T	G
semipapposum, *DeCandolle*	...	...	W	M	A	N	Y			T	G
Dockerii, *F. v. Mueller*...	...	...	...	M							
Thomsoni, *F. v. Mueller*	...	F									
decurrens, *F. v. Mueller*	...	...	...	M	A	N		L			
retusum, *Sonder & F. v. Mueller*	...	S		M	A	N	Y	L	K		
ferrugineum, *Lessing* ...	...	...	...	...	...	...	...	...	G
cinereum, *F. v. Mueller*	...	...	...	...	...	...	...	...	G
Kempei, *F. v. Mueller* ...	...	F									

Polycalymma, F. v. Mueller.

Stuartii, *F. v. Mueller* ...	...	F	C	S	W	M						T	

Hyalolepis, DeCandolle.

rhizocephala, *DeCandolle*	...	...	...	M		N	Y	L	K	T	G
Rudallii, *F. v. Mueller*...	...	F	C											

Angianthus, Wendland (1809).

pleuropappus, *Bentham*	...	...	...	...	...	L					
brachypappus, *F. v. Mueller*	...	...	S								
tomentosus, *Wendland* ...	...	F	S	M	A	N	Y	L	T	
pusillus, *Bentham*	...	F	C	S	W	M								
tenellus, *Bentham*	...	...	...	...	...	...	L				

Skirrophorus, DeCandolle.

strictus, *A. Gray*	...	...	...	S	M	A	N	Y	L	K	T	
Preissianus, *Steetz*	...	...	...	...	...	A			L	K	T	G

Gnephosis, Cassini (1820).

Burkittii, *Bentham*	...	...	W								
eriocarpa, *Bentham*	...	...	C								
arachnoidea, *Turczaninow*	...	C	S								
cyathopappa, *Bentham*...	...	...	...	M							
codonopappa, *F. v. Mueller*	...	C									
skirrophora, *Bentham* ...	...	C	S	M							

Calocephalus, R. Brown (1817).

Drummondii, *Bentham*...	...	...	W	A	Y	L	T	
Brownii, *F. v. Mueller*...	...	...	...	...	A	Y	L	K	G
Sonderi, *F. v. Mueller* ...	...	...	...	M							
lacteus, *Lessing* ...	...	...	...	...	...	A								
citreus, *Lessing* ...	...	...	...	...	...	A	N	Y		T	G
platycephalus, *Bentham*	...	F	C	S										
Dittrichii, *F. v. Mueller*	...	C									

Eriochlamys, Sonder & F. v. Mueller (1852).

Behrii, *Sonder & F. v. Mueller*	...	...	M		N		L	K	T	
Knappii, *F. v. Mueller*...	...	F									

Cephalipterum, A. Gray (1852).

Drummondii, *A. Gray*... ... ... W

Gnaphalodes, A. Gray (1852).

uliginosum, *A. Gray* ... ... S W M A N Y T

Pterocaulon, Elliot (1824).

sphacelatus, *Benth. & Hook.* ... F C S
Billardieri, *F. v. Mueller* ... F

Craspedia, G. Forster (1786).

Richea, *Cassini* ... ... A N Y L T G
chrysantha, *Bentham* ... ... C M A
globosa, *Bentham* ... ... S N
pleiocephala, *F. v. Mueller* ... C S W M

Chthonocephalus, Steetz (1845).

pseudevax, *Steetz* ... ... C W

Microseris, D. Don (1832).

Forsteri, *J. Hooker* ... ... A N Y L K T G

CANDOLLEACEAE.

Candollea, Labillardiere (1805).

graminifolia, *Swartz* ... ... A K G
Tepperiana, *F. v. Mueller* ... ... K
calcarata, *R. Brown* ... ... A Y K G
perpusilla, *Hooker* ... ... G
floribunda, *R. Brown* ... ... F
despecta, *R. Brown* ... ... S A N L K T G

Leewenhoekia, R. Brown (1810).

dubia, *Sonder* ... ... A Y L K T G

CAMPANULACEAE.

Lobelia, Linne (1737).

rhombifolia, *DeVriese* ... ... A K
microsperma, *F. v. Mueller* ... ... A Y L K
Browniana, *Roem. & Schultes* ... ... G
simplicicaulis, *R. Brown* ... ... G
heterophylla, *Labillardiere* ... F
purpurascens, *R. Brown* ... ... G
pedunculata, *R. Brown* ... ... A G
concolor, *R. Brown* ... ... M
platycalyx, *F. v. Mueller* ... ... K G
anceps, *Thunberg* ... ... A N L K T G
pratioides, *Bentham* ... ... T G
Benthami, *F. v. Mueller* ... C

Isotoma, R. Brown (1810).

petraea, *F. v. Mueller* ... ... F C S W N
scapigera, *G. Don* L
fluviatilis, *F. v. Mueller* ... ... T G

Wahlenbergia, Schrader (1814).

gracilis, *DeCandolle* ... ... F C S W M A N Y L K T G

GOODENIACEAE.

Brunonia, Smith (1809).

australis, *Smith* ... ... F A T G

Leschenaultia, R. Brown (1810).

divaricata, *F. v. Mueller* ... F C
striata, *F. v. Mueller* ... ... F

Dampiera, R. Brown (1810).

stricta, *R. Brown* ... ... G
candicans, *F. v. Mueller* ... F
rosmarinifolia, *Schlechtendal* ... ... W M A N Y L T
marifolia, *Bentham* ... ... M
lanceolata, *Cunningham* ... ... M K

Velleya, Smith (1798).

paradoxa, *R. Brown* ... ... M A N Y L G
connata, *F. v. Mueller* ... ... F W M

Selliera, Cavanilles (1799).

radicans, *Cavanilles* ... ... A L K

Catosperma, Bentham (1868).

Muelleri, *Bentham* ... ... F

Scaevola, Linne (1771).

spinescens, *R. Brown* ... ... F C S W M Y
Groeneri, *F. v. Mueller* ... ... W
crassifolia, *Labillardiere* ... ... W A Y L K G
parvifolia, *F. v. Mueller* ... F
depauperata, *R. Brown* ... F C
collaris, *F. v. Mueller* ... ... C W
suaveolens, *R. Brown* ... ... T G
microcarpa, *Cavanilles* ... ... A N G
aemula, *R. Brown* ... ... F S W L K G
humilis, *R. Brown* ... ... S W N K
ovalifolia, *R. Brown* ... ... F C W
linearis, *R. Brown* ... ... A Y L K

Goodenia, Smith (1794).

Ramelii, *F. v. Mueller* ... ... F
humilis, *R. Brown* ... ... G
amplexans, *F. v. Mueller* ... ... A N K
ovata, *Smith* ... ... A Y L K G
varia, *R. Brown* ... ... S W M A N Y L K
Vilmoriniae, *F. v. Mueller* ... F
grandiflora, *Sims* ... ... F
Chambersii, *F. v. Mueller* ... F
albiflora, *Schlechtendal* ... ... A N Y
calcarata, *F. v. Mueller* ... ... S W

Nicholsoni, *F. v. Mueller*	...	F												
Mitchellii, *Bentham* ...	...	F	C											
heterochila, *F. v. Mueller*	...	F												
sepalosa, *F. v. Mueller* ...	...	F												
Mueckeana, *F. v. Mueller*	...	F												
Strangfordii, *F. v. Mueller*	...	F												
geniculata, *R. Brown* ...	...	...			W	M	A	N	Y	L	K	T	G	
hirsuta, *F. v. Mueller* ...	...	F												
cycloptera, *R. Brown* ...	...	F	C	S	W				Y					
glauca, *F. v. Mueller* ...	...		C	S		M	A	N	Y					
microptera, *F. v. Mueller*	...		C											
elongata, *Labillardiere*...	...		...		...	...		...		...		...	G	
heteromera, *F. v. Mueller*	...		C			M								
pinnatifida, *Schlecht.* ...	...		...	S	W	M	A	N	Y	L		T	G	
pusilliflora, *F. v. Mueller*	...		...	S	W									

Calogyne, R. Brown (1810).

Berardiana, *F. v. Mueller*	...	F												

PRIMULACEAE.

Centunculus, Linne (1753).

minimus, *Linne* ...	...	...	...	...	...	...	...	...	...	G				

Samolus, Linne (1753).

repens, *Persoon* ...	...	..	F		M	A	N	Y	L	K	T	G		

CONVOLVULACEAE.

Ipomoea, Linne (1737).

Davenporti, *F. v. Mueller*	...	F												
costata, *F. v. Mueller* ...	...	F												
Muelleri, *Bentham* ...	...	F												
heterophylla, *R. Brown*	...	F	C											

Convolvulus, Linne (1753).

erubescens, *Sims*	...	...	F	C	S	W	M	A	N	Y	L	K	T	G
sepium, *Linne* ...	...	...	...	...	...	...	...	A					T	G

Polymeria, R. Brown (1810).

longifolia, *Lindley*	...	...	F	C										
angusta, *F. v. Mueller* ...	...	F	C											

Breweria, R. Brown (1810).

rosea, *F. v. Mueller*	...	...	F											
media, *R. Brown*	...	...		C										

Evolvulus, Linne (1763).

linifolius, *Linne* ...	...	...	F	C										

Cressa, Linne (1747).

Cretica, *Linne* ...	...	...	...	...	M									

Dichondra, Forster (1776).

repens, *Forster* ...	...	...	...	S		A	N		L	K	T	G		

Wilsonia, R. Brown (1810).

humilis, *R. Brown*	...	...	...	...	...	A		Y	L	K				
rotundifolia, *Hooker*	...	...	...	...	...	A		Y	L	K	T			
Backhousii, *Hooker*	...	...	...	...	...	...	...	...	K	T	G			

CUSCUTA, Linne.

australis, *R. Brown*	...	...	F											
Tasmanica, *Engelmann*	...	...	...	...	...	...	...	...	T					

BORAGINEAE.

Coldenia, Linne (1747).

procumbens, *Linne*	...	...	C											

Heliotropium, Linne.

curassavicum, *Linne*	...	...	F	C	S		M	A				T		
pleiopterum, *F. v. Mueller*	...	F												
Europaeum, *Linne*	...	...	...	S				N						
undulatum, *Vahl*	...	...	F	C		W								
asperrimum, *R. Brown*	...	...	F	C	S			A	N					
ovalifolium, *Forskael*	...	...		C										
filaginoides, *Bentham*	...	...	F	C										
tenuifolium, *R. Brown*	...	...	F											

Halgania, Gaudichaud (1826).

cyanea, *Lindley*	...	...	...	F	C	S	W	M	A		Y	L		
lavandulacea, *Endlicher*	...	...		...			W		A		Y		K	T

Pollichia, Medikus (1783).

Zeylanica, *F. v. Mueller*	...	...	F	C	S									

Rochelia, Reichenbach (1824).

Maccoya, *F. v. Mueller*	...	...	...	M										

Echinospermum, Swartz.

concavum, *F. v. Mueller*	...	...	C	S	W	M	A	N	Y					

Eritrichium, Schrader (1820).

Australasicum, *DeCandolle*	...	...	...	S		M		N	Y					G

Myosotis, Linne.

australis, *R. Brown*	...	...	...	...	M	A		Y		K				G

Cynoglossum, Linne.

suaveolens, *R. Brown*	...	...	...	...	M	A	N	Y			T	G		
australe, *R. Brown*	...	...	...	...	...	A			L		T	G		
Drummondii, *Bentham*	...	...	F	C	S			N						

ASCLEPIADEAE.

Sarcostemma, R. Brown (1809).

australe, *R. Brown*	...	...	F	C	S	W	M		N					

Cynanchum, Linne (1737).

floribundum, *R. Brown* ... F C S

Daemia, R. Brown (1809.)

Kempeana, *F. v. Mueller* ... F C

Marsdenia, R. Brown (1809).

Leichhardtiana, *F. v. Mueller* F C S M

APOCYNEAE.

Carissa, Linne (1767).

Brownii, *F. v. Mueller*... ... F

Alyxia, Banks (1810).

buxifolia, *R. Brown* ... ...A N Y L K T G

Notonerium, Bentham (1876).

Gossei, *Bentham* ... ... F

GENTIANEAE.

Sebaea, Solander (1810).

ovata, *R. Brown* ... ... M A N Y L K T G
albidiflora, *F. v. Mueller* ... ... G

Erythraea, Persoon (1805).

spicata, *Persoon*... ... ... F C A N Y L K T G

Gentiana, Linne.

saxosa, *Forster* ... ... T G

Limnanthemum, Gmelin.

crenatum, *F. v. Mueller* ... ... M
reniformis, *R. Brown* ... ... S M A N L K T G

JASMINEAE.

Jasminum, Linne.

lineare, *R. Brown* ... ... F S M N
calcareum, *F. v. Mueller* ... F

PLANTAGINEAE.

Plantago, Linne.

varia, *R. Brown* ... ... C S W M A N Y L K T G

LOGANIACEAE.

Mitrasacme, Labillardiere (1804).

pilosa, *Labillardiere* ... ... G
paradoxa, *R. Brown* ... ... M A N Y L K G
distylis, *F. v. Mueller* .. ..A K

Logania, R. Brown (1810).

longifolia, *R. Brown*							A	N						
crassifolia, *R. Brown*								...		L	K	T	G	
ovata, *R. Brown*...							A		Y	L	K		G	
stenophylla, *F. v. Mueller*					W									
linifolia, *Schlecht.*							A		Y			T		
nuda, *F. v. Mueller*					W	M								

SOLANACEAE.

Solanum, Linne.

nigrum, *Linne*			C	S				A	N			K		G
aviculare, *Forster*				...		...		...	...		...		...	G
simile, *F. v. Mueller*				...	S	W	M	A	N	Y	L	K		
fasciculatum, *F. v. Mueller*						W				Y	L			
ferocissimum, *Lindley*			F		S									
orbiculatum, *Dunal*				C		W								
oligacanthum, *F. v. Mueller* ...			F	?										
esuriale, *Lindley*			F	C		W	M		N					
chenopodium, *F. v. Mueller* ...				C										
Sturtianum, *F. v. Mueller* ...			F	C	S	W								
hystrix, *R. Brown*				...		W								
eremophilum, *F. v. Mueller* ...				C	S				N					
lacunarium, *F. v. Mueller* ...				C	S	W								
petrophilum, *F. v Mueller* ...			F	C	S	W								
ellipticum, *R. Brown*			F	C	S	W								

Lycium, Linne (1737).

australe, *F. v. Mueller*				S	W	M	A		Y					

Anthotroche, Endlicher (1839).

Blackii, *F. v. Mueller*			F											

Datura, Linne (1737).

Leichhardtii, *F. v. Mueller* ...			F		S									

Nicotiana, Linne.

suaveolens, *Lehmann*			F	C	S	W	M	A	N	Y	L	K		G

Duboisia, R. Brown (1810).

Hopwoodi, *F. v. Mueller* ...			F			W								

Anthocercis, Labillardiere (1806).

anisantha, *Endlicher*						W					L			
angustifolia, *F. v. Mueller*					S			A						
myosotidea, *F. v. Mueller*												K	T	
Eadesii, *F. v. Mueller*													T	

EPACRIDEAE.

Brachyloma, Sonder (1845).

ericoides, *Sonder*							M	A				K		
daphnoides, *Bentham*													T	
ciliatum, *Bentham*								A					T	G

Styphelia, Solander (1786).

adscendens, *R. Brown* ...	...	...	...	...	...	...	...	...	G
pusilliflora, *F. v. Mueller*	...	...	...	...	...	...	...	...	G
Sonderi, *F. v. Mueller* ...	...	...	W	A		L	K	T	G
humifusa, *Persoon* ...	...	...	...	...	A	N	Y	L	K	T	G
strigosa, *Smith*	...	...	...	...	A			L	K		
australis, *F. v. Mueller*	...	...	...	...	A						G
Richei, *Labillardiere* ...	...	...	...	...	A	N	Y	L	K	T	G
costata, *F. v. Mueller* ...	...	...	...	...		...		...	K		
striata, *Sprengel*... ...	...	...	W								
collina, *Labillardiere* ...	...	...	...	...		...		...		T	
hirsuta, *F. v. Mueller* ...	...	...	...	...		...		...	K		
concurva, *F. v. Mueller*	...	...	...	...	A				K		
virgata, *Labillardiere* ...	...	...	...	...	A					T	G
ericoides, *Smith*	...	...	...	...		...		...		...	G
cordifolia, *F. v. Mueller*	...	...	W	M	A		Y	L			
hirtella, *F. v. Mueller* ...	...	...	...	...	A				K		
rufa, *F. v. Mueller* ...	...	...	...	...	A			L	K		
Woodsii, *F. v. Mueller*...	...	...	...	...		...		...	K		G
serrulata, *Labillardiere*	...	...	...	...	A				K		
patula, *Sprengel* ...	...	...	...	...	A		Y	L	K		
ovalifolia, *Sprengel* ...	...	...	...	...	A	N	Y	L	K	T	G
depressa, *Sprengel* ...	...	...	...	...	A				K	T	
fasciculiflora, *F. v. Mueller*	...	...	...	...	A				K		
elliptica, *Smith*	...	...	...	...		...		...		...	G

Epacris, Cavanilles (1797).

impressa, *Labillardiere*	...	...	...	...	A				K	T	G
obtusifolia, *Smith* ...	...	...	...	...		...		...		...	G
lanuginosa, *Labillardiere*	...	...	...	...		...		...		...	G
microphylla, *R. Brown*	...	...	...	...		...		...		...	G

Sprengelia, Smith (1794).

incarnata, *Smith* ...	...	...	...	...	A				K		G

LABIATAE.

Mentha, Linne.

australis, *R. Brown* ..	...	F	C		M	A					T	G
gracilis, *R. Brown* ...	...	...	...	...	...	A					T	G
satureioides, *R. Brown*...	...	...	S			A	N	Y	L		T	G

Teucrium, Linne.

sessiliflorum, *Bentham* ...	...	...	W	M		N	Y	L			
integrifolium, *F. v. Mueller*	...	F									
corymbosum, *R. Brown*	...	...	S	W		N					G
racemosum, *R. Brown* ...	...	F	C	S	W	M	A	N	Y	L		

Ajuga, Linne (1737).

australis, *R. Brown* ...	...	...	S		M	A	N			K		G

Microcorys, R. Brown (1810).

Macrediana, *F. v. Mueller*	...	F	

Westringia, Smith (1797).

rigida, *R. Brown* ... ... W M A N Y L K
Dampieri, *R. Brown* ... ... W L

Lycopus, Linne.

australis, *R. Brown* ... ... M A T G

Plectranthus, L'Heritier (1785).

parviflorus, *Willdenow* ... ... F

Prunella, Linne.

vulgaris, *Linne* ... ... A G

Scutellaria, Linne.

humilis, *R. Brown* ... ... K

Prostanthera, Labillardiere (1806).

lasiantha, *Labillardiere* ... ... G
rotundifolia, *R. Brown* ... ... T
striatiflora, *F. v. Mueller* ... F C S W
Wilkieana, *F. v. Mueller* ... F
eurybioides, *F. v. Mueller* ... ... A
spinosa, *F. v. Mueller* ... ... S L K T
Behriana, *Schlechtendal* ... ... A T
Baxteri, *Cunningham* ... ... W
ringens, *Bentham* ... ... F
coccinea, *F. v. Mueller* ... ... M A Y L K T
chlorantha, *F. v. Mueller* ... ... A Y L K
calycina, *F. v. Mueller* L

LENTIBULARINEAE.

Utricularia, Linne (1737).

flexuosa, *Vahl* ... ... G
dichotoma, *Labillardiere* ... ... A K T G
lateriflora, *R. Brown* ... ... G

Polypompholyx, Lehmann (1844).

tenella, *Lehmann* ... ... A K G

OROBANCHEAE.

Orobanche, Linne.

australiana, *F. v. Mueller* ... C S W A Y L

SCROPHULARINEAE.

Mimulus, Linne (1741).

gracilis, *R. Brown* ... ... G
repens, *R. Brown* ... ... M A N L K
prostratus, *Bentham* ... ... F C

Mazus, Loureiro (1790).

pumilio, *R. Brown* ... ... G

Buechnera, Linne (1737).

linearis, *R. Brown* .. ... F

Limosella, Linne.

aquatica, *Linne* ... ... S M A N L K G
Curdieana, *F. v. Mueller* ... ... S W M

Peplidium, Delile (1813).

humifusum, *Delile* ... ... F
Muelleri, *Bentham* C

Glossostigma, Arnott (1836).

Drummondii, *Bentham*... ... ... M
elatinoides, *Bentham* ... ... M

Euphrasia, Linne.

Brownii, *F. v. Mueller* ... ... W A N Y L K T G
scabra, *R. Brown* ... ... A L G

Stemodia, Linne (1759).

Morgania, *F. v. Mueller* ... F C S M A
viscosa, *Roxburgh* ... ... F
pedicellaris, *F. v. Mueller* ... F

Gratiola, Linne.

pedunculata, *R. Brown*... ... ... M
Peruviana, *Linne* ... ... M A K G

Veronica, Linne.

decorosa, *F. v. Mueller* ... ... S N
Derwentia, *Andrews* ... ... A K G
gracilis, *R. Brown* ... ... A N G
distans, *R. Brown* ... ... A L K T
calycina, *R. Brown* ... ... Y K G
peregrina, *Linne* ... ... A N G

BIGNONIACEAE.

Tecoma, Jussieu (1789).

australis, *R. Brown* ... ... F

ACANTHACEAE.

Justicia, Linne (1737).

procumbens, *Linne* ... ... F C S
Bonneyana, *F. v. Mueller* ... ... M
Kempeana, *F. v. Mueller* ... F

Ruellia, Linne.

australis, *R. Brown* ... ... C M
primulacea, *F. v. Mueller* ... F C

PEDALINEAE.

Josephinia, Ventenat (1804).

Eugeniae, *F. v. Mueller* ... C

VERBENACEAE.

Verbena, Linne.

officinalis, *Linne* ... ... M A T G
macrostachya, *F. v. Mueller* ... F C

Newcastlia, F. v. Mueller (1857).

cladotricha, *F. v. Mueller* ... F
spodiotricha, *F. v. Mueller* ... F C
cephalantha, *F. v. Mueller* ... F
bracteosa, *F. v. Mueller* ... F
Dixoni, *F. v. Mueller & Tate* ... ... M N

Dicrastylis, Drummond & Harvey (1855).

ochrotricha, *F. v. Mueller* ... F
Gilesii, *F. v. Mueller* ... ... F
Doranii, *F. v. Mueller* ... ... F
Beveridgei, *F. v. Mueller* ... F W
Lewellini, *F. v. Mueller* ... F

Clerodendrum, Burmann (1737).

floribundum, *R. Brown*... ... F

Spartothamnus, Cunningham (1830).

teucriiflorus, *F. v. Mueller* ... F
puberulus, *F. v. Mueller* ... F

Avicennia, Linne (1737).

officinalis, *Linne* ... ... A N Y L

MYOPORINEAE.

Myoporum, Banks & Solander (1786).

montanum, *R. Brown* ... ... F C S M
insulare, *R. Brown* ... ... A N Y L K T G
viscosum, *R. Brown* ... ... A N Y K G
deserti, *Cunningham* ... ... S W M N Y
humile, *R. Brown* ... ... W M A Y L K G
brevipes, *Bentham* C
platycarpum, *R. Brown* ... ... S W M A N Y T

Eremophila, R. Brown (1810).

Dalyana, *F. v. Mueller*... ... C
scoparia, *F. v. Mueller*... ... C S W M N T
Delisserii, *F. v. Mueller* ... ... W
crassifolia, *F. v. Mueller* L
Behriana, *F. v. Mueller* ... ... A Y L K
Weldii, *F. v. Mueller* ... ... W
Christophori, *F. v. Mueller* ... F
densifolia, *F. v. Mueller* ...

gibbosifolia, *F. v. Mueller*	...	...	...	...	A			L		T			
divaricata, *F. v. Mueller*	...	...	...	M						T			
polyclada, *F. v. Mueller*	...	C		M									
Goodwinii, *F. v. Mueller*	...	F	C										
Elderi, *F. v. Mueller* ...	...	F		S									
Willsii, *F. v. Mueller* ...	...	F											
santalina, *F. v. Mueller*	...	...	S										
longifolia, *F. v. Mueller*	...	F	C	S	W	M		N	Y				
Freelingii, *F. v. Mueller*	...	F	C	S									
bignoniflora, *F. v. Mueller*	...	F	C			M						T	
MacDonneli, *F. v. Mueller*	...	F	C	S	W								
Bowmani, *F. v. Mueller*	...		C										
rotundifolia, *F. v. Mueller*	...	F	C										
leucophylla, *Bentham* ...	...	F											
Paisleyi, *F. v. Mueller* ...	...	...		W									
Sturtii, *R. Brown* ...	...	F	C										
exilifolia, *F. v. Mueller*	...	F											
Mitchelli, *Bentham* ...	...	F											
Gibsoni, *F. v. Mueller* ...	...	F											
Berryi, *F. v. Mueller* ..	...	...		W									
Clarkei, *F. v. Mueller* ...	...	F											
Gilesii, *F. v. Mueller* ...	...	F	C										
Hughesii, *F v. Mueller*	...	F											
oppositifolia, *R. Brown*	...	...	S	W			N						
Latrobei, *F. v. Mueller*...	...	F	C	S	W								
Brownii, *F. v. Mueller* ...	...	F	C	S	W	M			Y		K	T	
Duttonii, *F. v. Mueller*...	...		C	S									
Maculata, *F. v. Mueller*	...	F	C	S	W	M							
denticulata, *F. v. Mueller*	...		...		W								
latifolia, *F. v. Mueller* ...	...		C	S	W	M							
alternifolia, *R. Brown* ...	...	F		S	W	M		N					

CONIFERAE.

Callitris, Ventenat (1808).

verrucosa, *R. Brown* ...	...	F		S		M	A	N	Y	L	K	T
cupressiformis, *Ventenat*	...	...		...		...	A				K	

CYCADEAE.

Encephalartos, Lehmann, (1834).

MacDonnelli, *F. v. Mueller* ... F

HYDROCHARIDEAE.

Ottelia, Persoon (1805).

ovalifolia, *Richard*	...	...	...	...	M	A		K	G

Vallisneria, Linne (1753).

spiralis, *Linne* ...	...	...	...	..	M		G

Blyxa, Noronha (1806).

Roxburghii, *Richard* C

Hydrilla, Richard (1811).

verticillata, *Caspary* ... ... M

Halophila, DuPetit-Thouars (1806).

ovalis, *Hooker* ... ... A Y L K G

ORCHIDEAE.

Dipodium, R. Brown (1810).

punctatum, *R. Brown* ... ... A G

Cymbidium, Swartz (1799).

canaliculatum, *R. Brown* ... C

Thelymitra, Forster (1776)

ixioides, *Swartz* ... ... A G
longifolia, *Forster* ... ... A N Y K G
parviflora, *R. Brown* ... ... A
aristata, *Lindley* ... ... A L G
grandiflora, *Fitzgerald* ... ... A
fuscolutea, *R. Brown* ... ... A L
luteocilium, *Fitzgerald* ... ... A
urnalis, *Fitzgerald* ... ... A
flexuosa, *Endlicher* ... ... A K
antennifera, *Hooker* ... ... A Y K T G
carnea, *R. Brown* ... ... A Y
rubra, *Fitzgerald* ... ... A G

Calochilus, R. Brown (1810).

Robertsoni, *Bentham* ... ... A G

Diuris, Smith (1798).

punctata, *Smith* ... ... G
palustris, *Lindley* ... ... A Y L T G
maculata, *Smith* ... ...
pedunculata, *R. Brown* ... ... A Y G
sulphurea, *R. Brown* ... ... A K G
longifolia, *R. Brown* ... ... A L K G

Orthoceras, R. Brown (1810).

strictum, *R. Brown* ... ... A

Cryptostylis, R. Brown (1810).

longifolia, *R. Brown* ... ... G

Prasophyllum, R. Brown (1810).

elatum, *R. Brown* ... ... A Y K G
australe, *R. Brown* ... ... G
fuscum, *R. Brown* ... ... A Y L
patens, *R. Brown* ... ... A Y G
despectans, *Hooker* ... ... A
nigricans, *R. Brown* L

Spiranthes, L. C. Richard (1818).

australis, *Lindley* ... ... G

Microtis, R. Brown (1810).

porrifolia, *R. Brown*					A	N	Y	L	K	T	G
minutiflora, *F. v. Mueller*					A						G

Corysanthes, R. Brown (1810).

pruinosa, *Cunningham*					A				K		G

Pterostylis, R. Brown (1810).

concinna, *R. Brown*					A						
nana, *R. Brown* ... ... W									K		G
nutans, *R. Brown*						...		...	K		G
pedunculata, *R. Brown*					A						
curta, *R. Brown*...					A						
cucullata, *R. Brown*					A						G
praecox, *R. Brown*						...		...	K		
reflexa, *R. Brown*					A		Y				
obtusa, *B. Brown*											
barbata, *Lindley*					A		Y	L	K		
mutica, *R. Brown* ... ... W							Y	L			G
rufa, *R. Brown* ... ... S W					A		Y				
longifolia, *R. Brown*					A			L			G
vittata, *Lindley*...					A		Y		K		

Acianthus, R. Brown (1810).

caudatus, *R. Brown*						...		...	K		
exsertus, *R. Brown*					A		Y				

Cyrtostylis, R. Brown (1810).

reniformis, *R. Brown*					A		Y	L	K		G

Glossodia, R. Brown (1810).

major, *R. Brown*					A		Y				G

Lyperanthus, R. Brown (1810).

nigricans, *R. Brown*					A		Y		K		

Eriochilus, R. Brown (1810).

autumnalis *R. Brown*					A		Y		K		G
fimbriatus, *F. v. Mueller*					A						

Caladenia, R. Brown (1810).

Cairnsiana, *F. v. Mueller*					A						
reticulata, *Fitzgerald*					A						
toxochila, *Tate* ... ... W											
tentaculata, *Tate* ... ... W											
Menziesii, *R. Brown*					A						G
filamentosa, *R. Brown*						...		...	K		G
dilatata, *R. Brown*					A		Y	L	K	T	G
Patersoni, *R. Brown*					A	N	Y	L			G
leptochila, *Fitzgerald*					A	N					
latifolia, *R. Brown*					A		Y	L	K		G
coerulea, *R. Brown*					A						
carnea, *R. Brown*					A		Y		K		G
deformis, *R. Brown*					A		Y	L	K	T	G

IRIDEAE.

Patersonia, R. Brown (1807).

glauca, *R. Brown*	...	...	...	...	...	A					K			G
longiscapa, *Sweet*	...	...	...	...	...	A							T	G

Sisyrinchium, Linne (1737).

cyaneum, *Lindley*	...	...	...	...	...	A					K			G

AMARYLLIDEAE.

Hypoxis, Linne (1759).

hygrometrica, *Labillardiere*	...	...	...	...	...	...	...	...	...					G
glabella, *R. Brown*	...	...	...	...	...	A				L			T	G
pusilla, *Hooker*	...	...	...	...	W	M	A	N	Y	L				

Crinum, Linne (1737).

angustifolium *R. Brown*	...	F												
flaccidum, *Herbert*	...	...	C	S										
pedunculatum, *R. Brown*	...	...	...	M										

Calostemma, R. Brown (1810).

purpureum, *R. Brown*	...	...	...	...	...	A	N	Y						
luteum, *Sims*	...	...	...	C		M								

LILACEAE.

Burchardia, R. Brown (1810).

unbellata, *R. Brown*	...	...	...	...	...	A			Y	L	K			G

Wurmbea, Thunberg (1781).

dioica, *F. v. Mueller*	...	...	F	C	S		M	A	N	Y	L	K		G

Xerotes, R. Brown (1810).

longifolia, *R. Brown*	...	...	...	...	...	A							T	G
dura, *F. v. Mueller*	...	...	...	S			A	N	Y					
Brownii, *F. v. Mueller*	...	...	...	...	...	A								G
effusa, *Lindley*	...	...	...	...	W	M	A		Y					G
micrantha, *Endlich.*	...	...	...	...	...	A				L				
Thunbergii, *F. v. Mueller*	...	...	...	...	...	A								
glauca, *R. Brown*	...	...	...	...	W		A		Y	L			T	G
elongata, *Bentham*	...	...	...	...	...	...	...	...	...	...			...	G
leucocephala, *R. Brown*	...	F			W	M	A		Y					
juncea, *F. v. Mueller*	...	...	...	...	...	A				L			T	

Dianella, Lamarck (1780).

revoluta, *R. Brown*	...	...	...	W	M	A	N	Y						G
laevis, *R. Brown*	...	...	...	...	...	A					K			G

Bulbine, Linne (1737).

bulbosa, *Haworth*	...	...	...	...	...	A	N	Y	L					G
semibarbata, *Haworth*	...	...	C	S	W	M	A	N	Y	L	K	T		G

Caesia, R. Brown (1810).

vittata, *R. Brown*	...	...	...	...	...	A			Y					G
parviflora, *R. Brown*	...	...	...	...	...	A								

Arthropodium, R. Brown (1810).

paniculatum, *R. Brown*	...	...	...	...	...	...	...				...		G
minus, *R. Brown*	...	...	...	...	...	...	Y	L					
strictum, *R. Brown*	...	...	...	S		A	N	Y		K	T	G
fimbriatum, *R. Brown*	...	...	...	...	...	A			L	K		

Thysanotus, R. Brown (1810).

dichotomus, *R. Brown*	...	...	F			A			L	K			G
tuberosus, *R. Brown*	...	...	F		S	A				K	T	G
exasperatus, *F. v. Mueller*	...	...	S					Y				
Baueri, *R. Brown*	...	...	...		W	M	A		Y				G
Patersoni, *R. Brown*	...	...	...	...	...	...	A	N	Y	L	K	T	G
exiliflorus, *F. v. Mueller*	...	F	C										

Tricoryne, R. Brown (1810).

elatior, *R. Brown*	...	...	C			A			L				G

Chamaescilla, F. v. Mueller (1870).

corymbosa, *F. v. Mueller*	...	...	...	...	A			Y	L	K			G

Laxmannia, R. Brown (1810).

sessiliflora, *Decaisne*	...	...	...	...	...	A				K	T	G

Calectasia, R. Brown (1810).

cyanea, *R. Brown*	...	...	...	...	...	...	...				T	G

Corynotheca, F. v. Mueller (1870).

lateriflora, *F. v. Mueller*	...	F			M								

Xanthorrhoea, Smith (1798).

quadrangulata, *F. v. Mueller*	...	...	...	...	A					K	T	G
Tateana, *F. v. Mueller*	...	...	...	...	...	A			L	K		
minor, *R. Brown*	...	...	...	...	...	...	...	...			...	G
semiplana, *F. v. Mueller*	...	...	S		A	N		L			T	G

XYRIDEAE.

Xyris, Linne (1737).

operculata, *Labillardiere*	...	...	...	...	A								
gracilis, *R. Brown*	...	...	...	...	...	...	...	...	...	...	...	...	G

COMMELINEAE.

Commelina, Linne.

ensifolia, *R. Brown*	...	...	F										

ALISMACEAE.

Damasonium, Jussieu.

australe, *Salisbury*	...	...	...	...	M	A							

JUNCACEAE.

Luzula, DeCandolle (1805).

campestris, *DeCandolle*	...	...	...	...	A	N			L	K			G

Juncus, Linne.

planifolius, *R. Brown* ...	...	C				A					T	G
caespititius, *Meyer* ...	...	...	...		...	A	N			K		G
bufonius, *Linne* ...	...	...	S		M	A	N	Y	L	K	T	G
homalocaulis, *F. v. Mueller*	...	...	...		...		...		...		...	G
pallidus, *R. Brown* ...	...	...	S		M	A	N	Y	L	K	T	G
pauciflorus, *R. Brown* ...	...	...		...	...	A				K		G
communis, *Meyer* ...	...	...	S	W	M	A	N	Y	L		T	G
prismatocarpus, *R. Brown*	...	...	S		M	A	N					G
maritimus, *Lamarck* ...	...	...		...	...	A			L	K		

PALMAE.

Livistona, R. Brown (1810).

Mariae, *F. v. Mueller* ...	...	F											

TYPHACEAE.

Typha, Linne.

angustifolia, *Linne* ...	...	F		S		M	A	N		L	K	T	G

FLUVIALES.

Triglochin, Linne.

centrocarpa, *Hooker* ...	...	C	S	W	M	A		Y			K		G
mucronata, *R. Brown* ...	...	...		...		...	A			L	K	T	G
striata, *Ruiz & Pavon* ...	...	...		...	M	A	N			L	K	T	G
procera, *R. Brown* ...	...	...		...	M	A					K		G

Potamogeton, Linne.

Tepperi, *Bennett* ...	...	...	S		M	A	N			L	K	T	G
tenuicaulis, *F. v. Mueller*	...												
crispus, *Linne* ...	...	...	...	...	M								
ochreatus, *Raoul* ...	...	...	...		...	A					K		
acutifolius, *Link* ...	...	...	...		M								
pectinatus, *Linne* ...	...	...	...		...	A				L	K		

Posidonia, Koenig (1806).

australis, *Hooker* ...	...	...	...		...	A		Y					

Ruppia, Linne (1735).

maritima, *Linne*... ...	...	...	...		...	A				L	K	T	G

Zostera, Linne (1747).

nana, *Mertens*	...	...	...		...	A		Y					G
Tasmanica, *Mertens* ...	...	...	...		...	A							

Lepilaena, Drummond (1855).

Preissii, *F. v. Mueller* ...	...	C				A				L	K	T	G
australis, *Drummond* ...	...	...	...		...		...		...			T	

Cymodocea, Koenig (1806).

antarctica, *Endlicher* ...	...	...	...		...	A		Y	L				

Naias, Linne (1735).

tenuifolia, *R Brown* ... ... M
major, *Allioni* ... ... F

LEMNACEAE.

Lemna, Linna (1735).

trisulca, *Linne* ... ... M K G
minor, *Linne* ... ... M K G
oligorrhiza, *Kurz* ... ... T

Wolffia, Horkel (1839).

Michelii, *Schleiden* ... ... M G

RESTIACEAE.

Trithuria, J. Hooker (1860).

submersa, *Hooker* ... ... M K

Aphelia, R. Brown (1810).

gracilis, *Sonder* ... ... A K G
pumilio, *F. v. Mueller* ... ... A K G

Centrolepis, Labillardiere (1804).

polygyna, *Hieron* ... ... M L K G
glabra, *F. v. Mueller* ... ... M
aristata, *Roem. & Schult.* ... ... S M A Y L K T G
fascicularis, *Labillardiere* ... ... A G
strigosa, *Roem. & Schult.* ... ... S A N L K G

Lepyrodia, R. Brown (1810).

Muelleri, *Bentham* ... ... G

Restio, Linne (1767).

complanatus, *R. Brown* ... ... G
tetraphyllus, *Labillardiere* ... ... G

Leptocarpus, R. Brown (1810).

tenax, *R. Brown* ... ... A K G
Brownii, *Hooker* ... ... A L G

Calostrophus, Labillardiere (1806).

lateriflorus, *F. v. Mueller* ... ... A G
fastigiatus, *F. v. Mueller* ... ... A K G

Lepidobolus, Nees (1846).

drapetocoleus, *F. v. Mueller* ... ... A G

CYPERACEAE.

Lepidospora, F. v. Mueller (1875).

tenuissima, *F. v. Mueller* ... ... A G

Kyllingia, Rottboell (1773).

monocephala, *Rottboell*					M							
intermedia, *R. Brown*						A						

Cyperus, Linne.

eragrostis, *Vahl*		C				A						G
tenellus, *Linne*						A						
gracilis, *R. Brown*		C										
pygmaeus, *Rottboell*		C										
squarrosus, *Linne*		C										
difformis, *Linne*		C			M							
trinervis, *R. Brown*					M							
vaginatus, *R. Brown*	F	C	S		M	A	N		L		T	
holoschoenus, *R. Brown*	F											
Gilesii, *Bentham*		C										
fulvus, *R. Brown*		C										
alterniflorus, *R. Brown*			S	W								
Iria, *Linne*		C										
diphyllus, *Retzius*		C										
subulatus, *R. Brown*	F	C										
rotundus, *Linne*	F	C										
lucidus, *R. Brown*					M	A						
exaltatus, *Retzius*			S		M							

Schoenus, Linne (1737).

capillaris, *F. v. Mueller*										K		G
aphyllus, *Boeckeler*					M							
brevifolius, *R. Brown*						A						G
apogon, *Röm. & Schult.*						A	N	Y	L	K		G
axillaris, *Poiret*						A						
sculptus, *Boeckeler*									L	K		
fluitans, *Hooker*										K		
sphaerocephalus, *Poiret*												G
nitens, *Poiret*						A		Y	L	K	T	G
deformis, *Poiret*									L			
Tepperi, *F. v. Mueller*				W		A		Y	L	K		
discifer, *Tate*										K		

Fimbristylis, Vahl (1806).

communis, *Kunth*			S		M							
velata, *R. Brown*		C			M							
ferruginea, *Vahl*	F	C										
barbata, *Bentham*		C										
Neilsoni, *F. v. Mueller*					M							

Heleocharis, R. Brown (1810).

sphacelata, *R. Brown*			S			A	N			K		G
acuta, *R. Brown*			S		M	A	N		L	K	T	G
multicaulis, *Smith*			S			A	N			K		G
acicularis, *R. Brown*					M							

Scirpus, Linne.

pungens, *Vahl*					M	A	N		L			G
maritimus, *Linne*					M	A						
lacustris, *Linne*		C	S		M	A	N					G
litoralis, *Schrader*	F		S			A	N					

Isolepis, R. Brown.

fluitans, *R. Brown*						A				K		G
setacea, *R. Brown*						A				K		
riparia, *R. Brown*					M	A	N	Y	L	K		G
cartilaginea, *R. Brown*			C	S	M	A	N	Y	L	K		G
inundata, *R. Brown*				S	M	A	N			K		G
supina, *R. Brown*					M							
nodosa, *R. Brown*				S	M	A	N	Y	L	K		G

Lipocarpha, R. Brown (1818).

monocephala, *R. Brown*					M							

Fuirena, Rottboell (1818).

glomerata, *Lamarck*			F									

Carex, Linne.

inversa, *R. Brown*						A						G
chlorantha, *R. Brown*						A						
tereticaulis, *F. v. Mueller*			S			A	N		L	K	T	
paniculata, *Linne*						A				K		G
caespitosa, *R. Brown*			S			A	N					G
pumila, *Thunberg*						A	N					G
breviculmis, *R. Brown*						A						G
Gunniana, *Boott*			S			A						G
pseudocyperus, *Linne*						A				K		G

Caustis, R. Brown (1810).

pentandra, *R. Brown*						A				K		G

Cladium, P. Browne (1756).

mariscus, *R. Brown*						A						G
articulatum, *R. Brown*			S			A						G
glomeratum, *R. Brown*						A						G
tetraquetrum, *Hooker*						A				K		
schoenoides, *R. Brown*						A			L	K	T	G
filum, *R. Brown*						A		Y	L	K		G
Gunnii, *Hooker*						A						
junceum, *R. Brown*			S			A	N		L	K		G
trifidum, *F. v. Mueller*						A						
radula, *R. Brown*						A						G
psittacorum, *F v. Mueller*						A						G
lanigerum, *R. Brown*						A		Y	L			
deustum, *R. Brown*						A		Y	L	K	T	

Lepidosperma, Labillardiere (1804).

longitudinale, *Labillardiere*												G
exaltatum, *R. Brown*												G
gladiatum, *Labillardiere*						A		Y	L	K	T	G
elatius, *Labillardiere*						A						
concavum, *R. Brown*						A						
viscidum, *R. Brown*			S	W		A		Y	L	K		G
laterale, *R. Brown*					M	A						G
congestum, *R. Brown*									L			
globosum, *Labillardiere*												G
lineare, *R. Brown*						A				K		

semiteres, *F. v. Mueller*						A					T	
canescens, *Boeck.*						A					T	G
filiforme, *Labillardiere*						A				K	T	G
carphoides, *F. v. Mueller*						A			L	K	T	G

Chorizandra, R. Brown (1810).

enodis, *Nees*						A		Y	L	K		G

GRAMINEAE.

Setaria, Palisot (1812).

glauca, *Palisot*	F											
macrostachya, *H. B. & K.*	F											
viridis, *Palisot*	F	C	S									

Pennisetum, L. Richard (1805).

refractum, *F. v. Mueller*	F	C										

Panicum, Linne.

coenicolum, *F. v. Mueller*		C	S		M							
divaricatissimum, *R. Brown*	F		S		M	A						
prolutum, *F. v. Mueller*					M	A	N					
effusum, *R. Brown*		C	S	W	M	A	N					G
Mitchelli, *Bentham*		C										
decompositum, *R. Brown*	F	C	S	W								
spinescens, *R. Brown*					M							
Crus-galli, *Linne*					M	A						
adspersum, *Trinius*		C										
pauciflorum, *R. Brown*	F											
leucophaeum, *H. B. K.*	F	C	S	W			N					
argenteum, *R. Brown*	F											
gracile, *R. Brown*			S		M	A						
helopus, *Trinius*		C	S		M							
Gilesii, *Bentham*	F	C										
distachyum, *Linne*	F	C										
reversum, *F. v. Mueller*	F	C	S									

Spinifex, Linne (1767).

paradoxus, *Bentham*	F	C	S									
hirsutus, *Labillardiere*						A		Y	L	K	T	G

Neurachne, R. Brown (1810).

alopecuroides, *R. Brown*	F					A	N	Y	L		T	G
Mitchelliana, *Nees*					M							
Munroi, *F. v. Mueller*				W	M							

Hemarthria, R. Brown (1810).

compressa, *R. Brown*					N	A						

Imperata, Cyrillo (1792).

arundinacea, *Cyrillo*	F					A			L			

Erianthus, L. Richard (1803).

fulvus, *Kunth*	F	C			M							

Andropogon, Linne.

sericeus, *R. Brown*	F	C	S					N						
pertusus, *Willdenow*	F													
annulatus, *Forskael*		C												
punctatus, *Roxburgh*		C	S					N						
exaltatus, *R. Brown*	F	C	S				A	N						
bombycinus, *R. Brown*... ...	F					M	A						T	
gryllus, *Linne*	F													

Anthistiria, Linne, fil. (1779).

ciliata, *Linne*	F	C	S				A	N	Y	L			T	G
avenacea, *F. v. Mueller* ...	F	C				M								
membranacea, *Lindley*		C												

Eriochloa, Humboldt & Kunth (1815).

polystachya, *Humboldt & Kunth*	F	C	S			M								

Perotis, Aiton (1789).

rara, *R. Brown*	F	C	S											

Tragus, Haller (1768).

racemosus, *Haller*	F	C	S	W	M									

Ehrharta, Thunberg (1779).

stipoides, *Labillardiere*...							A					K		G

Pappophorum, Schreber (1791).

commune, *F. v. Mueller* ...	F	C	S	W	M	A	N							

Lepturus, R. Brown (1810).

incurvatus, *Trinius*					M	A	N	Y	L	K	T			
cylindricus, *Trinius*						A								G

Echinopogon, Palisot (1812).

ovatus, *Palisot*						A	N			K				G

Alopecurus, Linne (1735).

geniculatus, *Linne*			S		M	A								G

Stipa, Linne (1737).

elegantissima, *Labillardiere*			S	W	M	A		Y						
Tuckeri, *F. v. Mueller*...					M									
teretifolia, *Steudel*							...	Y	L	K				
flavescens, *Labillardiere*						A			L					
Muelleri, *Tate*						A								
setacea, *R. Brown*			S		M		N		L					
semibarbata, *R. Brown*... ...		C				A		Y	L	K	T	G		
pubescens, *R. Brown*			S		M		N							
aristiglumis, *F. v. Mueller*			S		M		N	Y	L	K				
scabra, *Lindley*	F	C	S		M	A		Y						G

Chloris, Swartz (1788).

pectinata, *Bentham*		C												
acicularis, *Lindley*	F	C	S		M		N							
truncata, *R. Brown*	F		S											
barbata, *Swartz*	F	C												
scariosa, *F. v. Mueller*	F													

Dichelachne, Endlicher (1833).

crinita, *J. Hooker*				S			A	N	Y		K		G
sciurea, *Hooker*							A				K		G

Agrostis, Linne (1735).

scabra, *Willdenow*								...		...		...	G
venusta, *Trinius*								...		...		...	G
densa, *F. v. Mueller*							A						
Solandri, *F. v. Mueller*						M	A	N	Y	L	K	T	G
quadriseta, *R. Brown*							A	N			K		
montana, *R. Brown*							A						

Aristida, Linne (1753).

stipoides, *R. Brown*			F	C	S								
arenaria, *R. Brown*			F	C	S		M	A					
leptopoda, *Bentham*					...		M						
Behriana, *F. v. Mueller* ...					...		M	A	N	Y		T	
ramosa, *R. Brown*			F		S								
calycina, *R. Brown*			F		S								

Amphipogon, R. Brown (1810).

strictus, *R. Brown*					W			A		Y			G

Pentapogon, R. Brown (1810).

Billardieri, *R. Brown*								A					

Sporobolus, R. Brown (1810).

Virginicus, *Humboldt & Kunth*				C	S		M	A		Y	L	K	G
Indicus, *R. Brown*			F										
Lindleyi, *Bentham*			F	C	S	W							
actinocladus, *F. v. Mueller* ...			F	C		W							

Cynodon, L. Richard (1805).

Dactylon, *Richard*							M	A					G
convergens, *F. v. Mueller* ...				C									
ciliaris, *Bentham*				C									

Aira, Linne (1737).

caespitosa, *Linne*								...		...		...	G

Eriachne, R. Brown (1810).

aristidea, *F. v. Mueller*... ...				C									
ovata, *Nees*				C									
pallida, *F. v. Mueller*			F										
scleranthoides, *F. v. Mueller* ...			F			W							
mucronata, *R. Brown*			F										
obtusa, *R. Brown*					...		M						

Triraphis, R. Brown (1810).

mollis, *R. Brown*			F	C	S	W	M						

Danthonia, DeCandolle (1805).

bipartita, *F. v. Mueller*...					...		M						
carphoides, *F. v. Mueller*					...		M		N				
penicillata, *F. v. Mueller*				S	W			A	N	Y	L	K	G
nervosa, *Hooker*...				S			M	A	N	Y		K	G

Astrebla, F. v. Mueller (1876).

pectinata, *F. v. Mueller* ... F C S
triticoides, *F. v. Mueller* ... C

Agropyron, Gaertner (1770).

scabrum, *Palisot* ... ... M A N Y K T G

Elytrophorus, Palisot (1812).

articulatus, *Palisot* ... ... C M

Arundo, Linne.

Phragmites, *Linne* ... ... F M A N L T G

Bromus, Linne (1735).

arenarius, *Labillardiere* ... F S W M A N Y L K T G

Festuca, Linne.

duriuscula, *Linne* ... ...A N

Diplachne, Palisot (1812).

loliiformis, *F. v. Mueller* ... F C S
Muelleri, *Bentham* C
fusca, *Palisot* ... ... C M

Schedonorus, Palisot (1812).

litoralis, *Palisot* ... ... S W M A N L K T

Distichlis, Rafinesque (1819).

maritima, *Rafinesque* ... ...A N Y K T G

Eleusine, Gaertner (1788).

cruciata, *Lamarck* ... ... F C S M
digitata, *Sprengel* ... ... F

Triodia, R. Brown (1810).

Mitchelli, *Bentham* ... ... F
pungens, *R. Brown* ... ... F
irritans, *R. Brown* ... ... F C S W M A N Y

Eragrostis, Palisot (1812).

tenella, *Palisot* ... ... F C
trichophylla, *Bentham* ... ... C S W
leptocarpa, *Bentham* ... ... C S
pilosa, *Palisot* ... ... M G
diandra, *Steudel...* ... ... M A
Brownii, *Nees* ... ... F S W M A L T G
concinna, *Steudel* ... ... F C
speciosa, *Steudel...* C
laniflora, *Bentham* ... ... C S
chaetophylla, *Steudel* ... ... C S M
eriopoda, *Bentham* ... ... M
lacunaria, *F. v. Mueller* ... ... M
falcata, *Gaudichaud* ... ... C M

Poa, Linne (1737).

Billardieri, *Steudel*	...	...	...	...	...	...	..	...	G
nodosa, *Nees*	...	...	...	...	M	A	N	L	T	G
caespitosa, *Forster*	...	...	...	S	W	A	N	Y	L	K	T	G
lepida, *F. v. Mueller*	...	...	...	W	M	N	Y	L	K	T
fluitans, *Scopoli*	...	...	...	...	...	A
Fordeana *F. v. Mueller*	...	...	...	M
syrtica, *F. v. Mueller*	...	...	...	...	...	A	Y	K	T
ramigera, *F. v. Mueller*	...	C	S	M

LYCOPODIACEAE.

Lycopodium, Linne.

Carolinianum, *Linne*	...	...	...	...	...	A
laterale, *R. Brown*	...	...	...	...	...	A	K
densum, *Labillardiere*	...	...	...	...	...	A

Selaginella, Palisot (1805).

Preissiana, *Spring*	...	...	...	...	...	A	K	T	G
uliginosa, *Spring*	...	...	...	...	...	...	...	...	G

RHIZOSPERMAE.

Azolla, Lamarck (1783).

pinnata, *R. Brown*	...	...	..	...	M
filiculoides, *Lamarck*	...	...	..	..	M	G

Marsilea, Linne (1735).

quadrifolia, *Linne*	..	..	F	C	S	M	A	G

Pilularia, Linne.

globulifera, *Linne*	...	...	...	S

FILICES.

Ophioglossum, Linne.

vulgatum, *Linne*	...	...	C	S	W	M	A	Y	K	G

Botrychium, Swartz (1800).

ternatum, *Swartz*	...	...	...	...	...	A

Schizaea, Smith (1791).

fistulosa, *Labillardiere*	...	...	...	...	...	A	K
bifida, *Swartz*	...	...	...	...	...	...	...	...	...	G

Gleichenia, Smith (1791).

circinata, *Swartz*	...	...	...	...	...	A

Osmunda, Linne.

barbara, *Thunberg*	...	...	...	...	...	A

Dicksonia, L'Heritier (1788).

Billardieri, *F. v. Mueller*	...	...	...	...	A	G

Lindsaea, Dryander (1791).

linearis, *Swartz* ... ... A G

Adiantum, Linne.

Æthiopicum, *Linne* ... ... W A K G

Pteris, Linne (1735).

aquilina, *Linne* ... ... A N L K G
arguta, *Aiton* ... ... L G
incisa, *Thunberg*... ... ... G

Lomaria, Willdenow (1809).

discolor, *Willdenow* ... ... A K
lanceolata, *Sprengel* ... ... G
Capensis, *Willdenow* ... ... A K

Asplenium, Linne (1737).

flabellifolium, *Cavanilles* ... ... A N L G
furcatum, *Thunberg* ... ... G
bulbiferum, *Forster* ... ... G

Aspidium, Swartz (1800).

molle, *Swartz* ... ... M
decompositum, *Sprengel* ... ... G

Polypodium, Linne.

punctatum, *Thunberg* ... ... G

Grammitis, Swartz (1800).

Reynoldsii, *F. v. Mueller* ... F
rutaefolia, *R. Brown* ... ... F C S W A N Y
leptophylla, *Swartz* ... ... A N K

Cheilanthes, Swartz (1806).

tenuifolia, *Swartz* ... ... F C S W A N Y L K G
vellea, *F. v. Mueller* ... ... F C S W
distans, *Braun* ... ... W A N Y
Clelandi, *F. v. Mueller & Tate* ... W

———o———

This Flora includes:—

Orders 101, Genera 553, Species 1,935.

Definitions of Four New Species of Australian Plants.

By Professor Ralph Tate, F.L.S., F.G.S., &c.

[Read October 1, 1889.]

Cryptandra scabrida.*

Spyridium scabridum, R.T. coll.

An erect twiggy shrub of about three to four feet high. Leaves linear-oblong, about quarter inch long, somewhat clustered, deeply channelled above, the margins recurved, bluntly notched at the end; upper side scabrous and sparsely hispid; under side with long subappressed hairs. Flower-heads very dense, in compact terminal cymes, surrounded by a few floral bracts much larger and broader than the leaves, densely beset with white woolly hairs.

By the Eleanor River, and at Karatta, on the Stun'sailboom River, Kangaroo Island (*R.T.*, January 24, 1883).

This species is closely related to *C. halmaturina* and *C. bifida*, from which it differs by the shape of the leaves and the nature of the investiture. The differential characters of the three seem to be as follows:—

Leaves cuneate-oblong, lobes short blunt, densely stellately-hairy, underside also with long simple hairs. *halmaturina*

Leaves narrow-cuneate, lobes longer subacute, upper side glabrous or nearly so, underside densely beset with long hairs. *bifida*

Leaves linear-oblong, somewhat clustered, deeply channelled above, bluntly notched at the end; upper side scabrous and sparsely hispid, underside with long subappressed hairs. *scabrida*

Caladenia toxochila.†

A slender slightly-hairy species of about nine inches high; one-, rarely two-,flowered. Leaves oblong-lanceolate, about four inches long.

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* Upper surface of leaves *somewhat rough*.

† *Bow-shaped* lip or labellum.

Sepals and petals brownish-red, with a yellowish or greenish margin. Dorsal sepal erect, narrower than the lateral sepals, which are flat, lanceolate, gradually pointed, and slightly clavate at the tip, with a minute glandular pubescence, and about half an inch long. Petals narrower than the sepals, of about the same length, tapering to a fine point, without any glandular pubescence. Labellum on a long claw, flat, crescent-shaped with a broad triangular apical extension, marked with brown forked veins diverging from the base; the anterior margins fringed with narrow blunt denticles; colour greenish-yellow, the middle lobe dark-brown. Length, quarter inch; breadth, three-eighths of an inch. Calli on long stalks, clustered in the centre and at the base, or obscurely four-rowed. Column much curved, broadly winged in the upper two-thirds, nearly half inch long

Caroona Hill, 45 miles due west of Port Augusta (*Dr. W. L. Cleland*, August, 1889).

This species in its short petals and sepals resembles *C. Cairnsiana* and *C. reticulata*, but differs especially by the shape of the labellum.

Caladenia tentaculata.*

A slender nearly glabrous species from six to twelve inches high; one- or two-flowered.

Sepals and petals pale-brown with a narrow dark-centre, tapering into long filiform points, and densely beset with short reddish glandular hairs; from one and a half to two inches long.

Labellum narrow, ovate-rhomboid, slightly contracted towards the tip, sessile, without lobes, streaked with brown forked lines, anterior margins shortly and bluntly serrate, about quarter of an inch long and one-eighth in width. Calli in two rows extending from the base to about half the length of the labellum, traceable beyond as dark spots. Column very short, winged throughout, slightly curved, under quarter of an inch long.

Caroona Hill, 45 miles due west of Port Augusta (Dr. W. L. Cleland, August, 1889).

In general appearance this new species resembles *C. filamentosa*; but its labellmm is proper to the Section Phlebochilus, from other species of which it is distinguished by its filiform sepals and rhomboid labellum.

In the following synopsis I have set out the leading characters of the species of Section Phlebochilus; of which two inhabit south-west Australia—*C. discoidea*, Lindley, and *C. multiclavia*, Reichenbach; three South Australia, viz., *C. reticulata*, Fitzgerald, *O. toxochila*, Tate, and *C. tentaculata*, Tate; and *C. Cairnsiana*, F. v. M., is common to the two regions.

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* Having tentacles or feelers in reference to the sepals and petals.

KEY TO THE SPECIES OF CALADENIA (SECT. PHLEBOCHILUS).

Labellum-margin entire.

Calli in two rows; labellum orbicular, shortly stalked; sepals lanceolate shortly acuminate. *Cairnsiana.**

Calli crowded, lower ones connate; labellum broadly ovate or rhomboidal, long-stalked; sepals lanceolate, tapering into long fine points. *multiclavia.*

Labellum-margin ciliated, toothed or serrate.

Labellum ciliate-fringed, broadly ovate or orbicular.

Calli crowded; labellum contracted at the base; sepals subulate-acuminate. *discoidea.*

Calli in four rows; labellum short-stalked; sepals lanceolate, shortly-acuminate. *reticulata.*

Labellum toothed or crenate.

Calli in two rows; labellum narrow ovate-rhomboid, sessile, bluntly serrate; sepals subulate-acuminate. *tentaculata.*

Calli crowded or in four rows; labellum crescent-shaped with a short lanceolate middle lobe, on a long stalk, toothed; sepals narrow-lancoolate. *toxochila.*

Schœnus discifer.†

Dwarf, densely tufted perennial. Leaves radical, linear, erect, flat, longitudinally veined, under two inches long; leaf-sheaths short, membranous, reddish-brown, neither bearded nor pointed. Stem solitary, about one inch; spikelet two and a half to three lines long, solitary, terminal, erect, sessile, ovate-lanceolate, pale-coloured; the erect leafy involucral bract continuing the stem, about one inch long.

Flowers about three in each spikelet, the two lower ones fertile; glumes glossy, straw-coloured, membranous, with a prominent green keel, acute; hypogynous bristles absent; stamens three, as long as the style; style-branches three. Nut ovoid, three-ribbed, smooth, black, with white streaks and blotches, or white mottled with black, raised on a bluntly triangular lamelliform disk.

Wet heath-ground, Central Dudley Peninsula, Kangaroo Island (*R.T.*, November, 1883).

This species belong to the Section Oligostachyæ of Bentham's arrangement in the Fl. Austral., and is related through its hypogynous disk to the leafless *S. minutulus*. In habit it resembles *S. Tepperi*, but is distinguished by its flat and veined leaves, by its two fertile flowers, and by its smooth ovoid disk-bearing nut.

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* Since describing *C. cardiochila*, certain discrepancies in the diagnosis of *C. Cairnsiana* given in the Fl. Australiensis have been cleared away by reference to the original description; and it seems probable that the former name is synonymous with the latter.

† *Having a disk.*

Further Notes on Australian Coleoptera, with Descriptions of New Species.

By the Rev. T. Blackburn, B.A.

VI.

[Read October 1, 1889.]

The specimens on which the following notes and descriptions are founded have been recently acquired or determined by me. They are inhabitants of the colony of South Australia, with one exception—a *Novius* from N. S. Wales. As I had the honour of reading a paper last October before this Society on the Australian *Coccinellidæ* (including some new species of *Novius*), it seems convenient to describe the present one here, although isolated from the other species to which this paper relates by its place in the catalogue of *Coleoptera* as well as by its habitat.

CARABIDÆ.

ACROGENYS.

A. australis, sp. nov. Angusta; elongata; sat depressa; crebre (capite minus crebre) sat fortiter punctulata; supra pilis brevibus dense vestita; prothorace canaliculato, quam latiori paullo longiori; elytris postice truncatis, striatis, interstitiis sat planis. Long., $2\frac{3}{5}$ l.; lat., $\frac{4}{5}$ l.

The antennæ are about half as long as the whole insect, and are very robust; all the joints are pubescent, the basal one scarcely half as long as the head, the rest all much shorter, the second shortest. The maxillary palpi are large and stout, with the apical joint elongate-triangular, the labial very small and slender with the apical joint cylindric. On the head an impression runs obliquely forward from either eye; these two impressions are connected by a transverse one in front, and are foveately deepened near their junction with it; from some points of view these deepened portions alone are noticeable, so that the head seems only bifoveate in front. The prothorax scarcely differs from that of *A. hirsuta*, Macl., except in being less strongly rounded in the front part of its sides, so that it is a little narrower in proportion to its length. The apex of the elytra is rotundate-truncate; none of their interstices are carinate. The puncturation of every part is a little less close and less coarse than in *A. hirsuta*.

Though so very much smaller than either of the previously described species of *Acrogenys*, I cannot doubt that this is a

member of the genus. Having only a single example I have not been able to dissect the parts of the head, and in so small an insect it is most difficult to see them clearly without dissection, but as far as I can see they are quite as in *A. hirsuta*. The only structural differences that I observe consist in the more abrupt truncation of the apex of the elytra and the greater bluntness, as far as I can observe it, of the median tooth of the mentum.

Adelaide district; in flood refuse of the Torrens.

DIABATICUS.

The following two species appear to belong to this genus, although its diagnosis (Cist. Ent. II., p. 324) is not very clear, unless one happened to possess a type of the American genus *Pinacodera*, with which it is compared, and unfortunately I have not such type, nor do I know of one in any Australian collection. Moreover, the expression "orbitu post-oculari rotundato-angustato" is obscure, and the sparseness of puncturation on the elytra can hardly be regarded as a generic character. The species before me seem however to be congeneric with *Plochionus australis*, Er., for which the genus was formed, and agree fairly with Bates' diagnosis as far as I can follow it, although I should scarcely call the claws "strongly" denticulated. The genus resembles *Phlœocarabus*, but differs *inter alia* in the shorter and stouter tarsi, smaller eyes, and elytra very much shorter in proportion to the head and prothorax.

[While this memoir has been in the printer's hands I have received from Mr. T. G. Sloane, of Sydney, some remarks on the generic affinities of these and other *Lebiides* on which I had asked his opinion. Mr. Sloane occupies a foremost place among the rising entomologists of Australia, and his residence in Sydney gives him the opportunity of consulting the oldest and best Australian collections; hence, I attribute considerable importance to his determinations. While disclaiming the ability to speak as a specialist on the *Lebiides*, he is disinclined to refer the following two species to *Diabaticus*, but is unable to refer them to any other described genus. As will be seen from my remarks (above) I think it quite possible that Mr. Sloane is right in this matter, but, nevertheless, it seems to me advisable to use the name *Diabaticus* for the present, rather than form a new genus closely allied to *Diabaticus*, especially as I can specify no good structural distinctive character. I think I have described the species under consideration sufficiently in detail to prevent any actual inconvenience arising from my having attributed them to a genus in which they can perhaps hardly maintain a permanent place.

I should add that Mr. Sloane tells me he cannot regard as genuinely pertaining to *Phlœocarabus* the South Australian spe-

cies that I have attributed to that genus, mentioning especially as distinctive of *Phlæocarabus* a much smaller second joint of the antennæ and a more *Xanthophæa*-like head. As Mr. Sloane has seen the insect on which the genus was founded I have no doubt he is right in the matter, but, nevertheless (as I pointed out in a paper read last week before the Linnean Society of N. S. Wales) these South Australian species agree very well with the published characters of *Phlæocarabus*, so that they can hardly be furnished with a new generic name except after a re-characterising of *Phlæocarabus*. Mr. Sloane's courtesy in making these comparisons however enables me to perceive the need of pointing out that my allusion to *Phlæocarabus* above refers to the South Australian species which I have attributed to that genus, and might possibly not apply to the original type.]

D. tumidiceps, sp. nov. Elongatus, capite prothoraceque conjunctis elytris vix brevioribus ; glaber ; sat nitidus ; obscure rufescens, elytris piceo-umbratis, antennis, palpis, pedibus, meso- et metasternis abdomineque, testaceis,-hoc ad latera piceo-maculato ; capite pone oculos fortiter dilatato ; hoc prothoraceque sparsim subtiliter punctulatis et subtiliter transversim rugatis ; elytris sat fortiter striatis, interstitiis vix convexis minus sparsim punctulatis, postice rotundato-truncatis. Long. $3\frac{1}{5}$ l. ; lat. 1 l.

Antennæ less than half as long as the whole insect, moderately robust, the second joint shorter than the rest, which are subequal. The head is subparallel, and scarcely narrower than the prothorax, and is longer (from the base to the apex of the labrum) than it is wide, being as wide across the post ocular dilatation as across the eyes ; there is a deep impression on either side at the inner front corner of the post ocular dilatation from which a furrow runs forward just within the eye, and curves forward across the head between the antennæ, in front of which the surface of the head is uneven. The prothorax is fully as long as wide, subtruncate in front, with the dorsal channel strong but abbreviated at both ends, the anterior angles quite rounded off, the sides very finely margined, roundly divergent hindward immediately behind the base and then gently convergent and almost straight to the base, which is narrower than the widest part of the segment by about a third part of the width of the latter ; the hind angles are subdentiform, with the adjacent surface a little explanate ; the anterior curved impression is very strong, the base rather strongly lobed in the middle. The elytra are widest behind the middle, where they are nearly twice as wide as the widest part of the prothorax ; there are two large punctures on the third interstice. The mentum is strongly toothed ;

the apical joint of the labial palpi is moderately securiform in the male, that of the maxillary being elongate, subcylindric, and truncate at the apex; the tarsi are moderately broad, glabrous, and nitid above, the joints of almost equal width, the fourth somewhat emarginate at the apex.

Port Lincoln; among débris on swampy ground, not common.

D. minor, sp. nov. Sat elongatus; capite prothoraceque conjunctis elytris parum brevioribus; glaber; sat nitidus; rufescens vel testaceo-rufus; capite, elytrorum umbris nonnullis, et sternorum abdominisque maculis nonnullis, piceis vel rufo-piceis; capite obsolete sat sparsim punctulato, pone oculos sat fortiter dilatato; prothorace sat fortiter transversim rugato; elytris subtiliter striatis, interstitiis sat planis, obsolete sparsim punctulatis, postice truncatis. Long., $2\frac{3}{5}$ l.; lat., $\frac{4}{5}$ l. (vix).

Head oval, a little narrower than the prothorax, scarcely so long as wide, and a little wider across the eyes than across the dilated part behind them. There is an obscure impression on either side between the antennæ. Prothorax nearly half again as wide as long, subtruncate in front; the dorsal channel fine, lightly impressed, and abbreviated at both ends; the anterior angles quite rounded off; the sides narrowly margined, moderately rounded and scarcely sinuate behind, but with the hind angles minutely subdentiform, the widest part about half again as wide as the base, which is moderately lobed in the middle, the anterior impression moderately defined. The elytra are about one-fifth again as long as the head and prothorax together, and about one-third again as wide as the prothorax, the widest part being near the apex. The puncturation of their interstices is much feebler than in *D. tumidiceps*.

Port Lincoln, in company with the preceding.

PHORTICOSOMUS.

P. robustus, sp. nov. Piceo-brunneus; antennis palpisque manifeste, pedibus vix, dilutioribus; antice leviter bisinuato, postice quam antice vix latiori, angulis posticis acutis subdentiformibus; elytris postice adlatera sinuatis, fortiter striatis, interstitiis sat convexis. Long., 7 l.; lat., $2\frac{4}{5}$ l.

Head (across the eyes) slightly narrower than the base of the prothorax; the latter half again as wide as its length down the middle, at its widest in front of the middle; the front margin and base of almost equal width, the front margin moderately concave and gently bisinuate; the front angles much rounded, and not at all produced forward as they are in *P. mucronatus*, Blackb.; the central channel moderately impressed, and at both ends much

abbreviated ; the sides strongly sinuated immediately before the hind angles, which are scarcely less dentiform than those of *P. mucronatus ;* the reflexed margin narrow, as in *P. brunneus* (narrower than in *mucronatus*); the surface transversely depressed in front of the disc, as in *brunneus*, Blackb., and with a curved anterior impression, also as in *brunneus*. The sculpture of the elytra is very similar to that of *P. brunneus* and *felix*, Schaum., except that the interstices are more convex.

The already-described species of *Phorticosomus*, neither very much larger nor very much smaller than this, and having the posterior angles of the prothorax sharply rectangular or subdentiform, are *similis*, Blackb. (this is a good deal smaller) and *mucronatus*. Both these have the elytral striæ very much feebler and the interstices flat. *P. mucronatus* also has the clypeus much less rugose, and the sides of the elytra very much more strongly sinuate near the apex.

South Australia ; I am uncertain of the exact locality.

PSELAPHIDÆ.

CTENISTES.

C. Adelaidæ, sp. nov. Rufescens; antennis elongatis; prothorace antice angustato, postice fovea magna impresso ; elytris prothorace dimidio longioribus ; oculis sat magnis.

Maris (?) metasterno profunde longitudinaliter sulcato; antennis elytrorum apicem attingentibus, articulis 1-7 conjunctis quam articuli 8-11 conjuncti multo brevioribus, articulis 8-10 gradatim brevioribus, articulo 11° quam 9us. et 10us. conjuncti vix breviori, apice oblique truncato. Long, $\frac{2}{3}$ l.

This species is, no doubt, rather close to *C. parvus*, Shp., which it resembles in the long antennæ (reaching the apex of the elytra when set back), the well defined simple fovea of the prothorax and the elytra about half again as long as the prothorax. The antennal joints, however, are very different in their proportions *inter se* ; the 10th joint being much longer than wide, and the 11th barely equal (not to the preceding three together but) to the preceding two. These antennal differences might be sexual, but they are accompanied with certain other distinctions, the eyes in the present species being by no means exceptionally small, and the elytra being rather strongly dilated behind—which seem quite inconsistent with specific identity. From *C. impressus*, Shp., the present species may be known *inter alia* by the prothorax being as long as wide, and scarcely narrower at the base than in the middle, and having a simple fovea, from *C. simplex*, Shp., by its long antennæ and non-transverse prothorax, from *C. vernalis*, King, and *C. Kreusleri*, King, by the very different antennal structure, although it is possibly the previously undes-

cribed sex of the latter (as the size and the antennal structure of the one sex are really the only distinctive characters mentioned in the description of that species), the size of which, however—said to be less than half a line—seems to point to distinctness, and moreover I have another species (mentioned below) which agrees much better with the description.

In flood débris near Adelaide.

C. Kreusleri, King. In flood débris of the Torrens I have taken both sexes of a *Ctenistes*, which I believe to be this species. The distinction between the sexes seems very slight except in respect of the antennæ. The sex that I take to be the male has the apical four joints of the antennæ together equal to the basal seven together, and forming a distinct club in which joints eight-ten are somewhat equal in length, and gradually increase in width, joint eleven being wider still, slightly longer than nine and ten together, and obtusely narrowed at the apex; the second ventral segment is scarcely longer than the following segments together, and bears an obscure impression slightly in front of its apical margin. In the other sex the apical four joints together of the antennæ are considerably shorter than the basal seven together, and are successively thickened, joint 8 being same length as 9, 10 scarcely shorter than the preceding two together, 11 scarcely shorter than the preceding three together; and the second ventral segment is decidedly longer than the following segments together and has no impression. The whole insect is of a very uniform pale castaneous colour, it is closely and rather coarsely asperate-punctulate, and somewhat closely clothed with short, crisp, whitish hairs. The prothoracic fovea appears somewhat forked in front. The antennæ are short (reaching back to about the middle of the elytra), and the eyes are much smaller than in *C. Adelaidæ*.

C. tenebricosus, sp. nov. (? female). ♀ Brunneo-niger; antennis sat brevibus; prothorace antice angustato, postice fovea magna impresso; elytris prothorace dimidio longioribus; oculis sat parvis. Long., $\frac{2}{3}$ l. (vix).

This species differs from all yet described as Australian of the genus, by its uniform blackish colour. It is more finely and sparsely punctured than *C. Kreusleri (?)*, and therefore more nitid; like that species it is clothed with short, crisp, whitish hairs. The prothorax is scarcely so long as wide, with a deep posterior fovea not at all forked in front, the general surface of the segment being even. The elytra are considerably narrower at the shoulders than behind. The antennæ scarcely differ in structure from those of the specimen which I regard as the female of *C. Kreusleri*.

Port Lincoln; in moss,

ARTICERUS.

A. asper, sp. nov. Ferrugineus, antennis pedisbusque testaceis, supra (abdominis basi nitida sparsim punctulata transversim profunde excavata excepta) subopacus, crebre aspere punctulatus; capite prothorace elytrisque obscure pubescentibus; antennis valde depressis, quam latiores parum longioribus, supra parte dimidia basali longitudinaliter impressa; capite quam antennæ vix longiori; prothorace fortiter transverso haud foveolato. Long., 1 l. (vix).

The antennæ are not much longer than wide on their flattened face, both sides of which are strongly rounded in outline, but the middle of the curve is on the outer side, a little nearer to the apex than on the inner side.

Of the other described species having antennæ impressed above, *Pascoeus*, Shp., has the prothorax not transverse; *aurifluus*, Schauf., has the inner margin of the antennæ straight, and *brevipes*, Shp., has the elytra punctured only indistinctly.

A single specimen was taken by me in flood refuse near Adelaide.

BYRRHIDÆ.

BYRRHUS.

I see no good structural character to prevent the following species being considered a true *Byrrhus*, although it should be noted that I have not been able to devote a specimen to dissection. It differs from the typical forms of the genus in having the body somewhat densely and evenly bristling with long erect hairs, and having the incrassation of the antennæ commencing only at the seventh joint. These latter consist of 11 joints, and are inserted, as in *Byrrhus;* the head is retracted in repose, but in such fashion that the eyes and labrum are visible (the former only in part); all the tarsi are laid stiffly back in repose against their tibiæ, which, however, are channelled by no means deeply for their reception. The apical joint of the maxillary palpi is somewhat more elongate and conic than in most species of *Byrrhus*.

B. Torrensensis, sp. nov. Oblongo-ovatus; nitidus; crebrius subtilius punctulatus; pilis longis nigris erectis sat dense vestitus; supra nigro-æneus, prothorace obscure viridi; subtus rufus vel piceo-rufus, antennis (clava picea excepta), palpis, labro, pedibusque, testaceis. Long., 1-1$\frac{3}{5}$ l.; lat., $\frac{3}{5}$-1 l.

The antennæ, if set back, would about reach the base of the prothorax; joint 1 is stout, and about as long as 3, 2 is very short, 3 nearly as long as 4, 5, and 6 together, the latter three subequal, and scarcely longer than wide, 7-11 forming a well-defined club.

Two specimens occurred to me in flood-refuse on the banks of the River Torrens.

ELATERIDÆ.

TETRALOBUS.

T. Fortnumi, Hope. I have lately received a male example of this genus taken by Mr. Read near Lake Eyre, which seems to be quite distinct from any species previously seen by me. It is broad in proportion to its length (long,, 13 l. ; lat., 4 l.), and its prothorax, instead of being more or less canaliculate down the middle, has a very faintly *raised* shining dorsal line. But the character on which I rely for specific distinctness consists in the structure of the antennæ in the male, the branches of which are much shorter than in any other *Tetralobus* I have seen, the longest of them being no longer than the distance between the antennæ at their base. The antennæ, moreover, are very short as a whole, reaching when laid back not further than to the front of the basal quarter of the prothorax. The colour of the insect is dark chestnut, the legs and antennæ (except the basal joint) being paler. The prothorax is (across the hind angles) exactly as wide as it is long down the middle. The elytra are very distinctly punctulate-striate, but the puncturation becomes feebler, and the striæ are obsolete near the apex. The interstices are feebly convex in the front half, and are punctured more sparingly than in any other *Tetralobus* that I have seen. The prothorax has the usual fovea on either side of the middle line near the front strongly marked.

As there are several descriptions of species of *Tetralobus* which scarcely mention more than generic characters it is very likely that this insect has already received a name, and it appears to me not at all unlikely to be *T. Fortnumi*, Hope. The only difficulties in so regarding it are that *T. Fortnumi* should be a somewhat *narrower* insect, and is said to have the longitudinal line of the prothorax "parum impressa ;" whereas in the specimen before me it is "haud impressa." This latter character, however, is probably variable (judging from other species of *Tetralobus*), and as it seems that *T. Fortnumi* is quite incapable of certain identification, and the measurements given by its author may be a trifle inexact, I think it will be well to assign the name to this insect, at any rate until some fresh evidence to the contrary may be forthcoming.

T. Manglesi, Hope. There are before me specimens of an insect belonging to my own collection and to those of the Adelaide Museum and of the Adelaide University Museum, taken in various parts of South Australia, which, I think, may be regarded as this species. Like most of its congeners, the species varies greatly in size, the smallest examples being long., 12 l., lat., $3\frac{1}{2}$ l. ; the largest long., 17 l., lat., 5 l. It is accordingly one of the widest of the genus in

proportion to its length. It is also characterised by the elytra being (not gradually narrowed from the base to the apex, but) slightly narrowed immediately behind the base, and then lightly dilated again, so that they are very slightly wider just before the apex than at any other part. The prothorax is just barely wider across the hind angles than its length down the middle, and immediately in front of the middle it is in both sexes almost or quite as wide as across the hind angles, which are only very slightly produced hindward or outward, the sides being gently sinuate. It is very closely and quite rugulosely punctulate in front, less so behind. Its dorsal channel is extremely feeble in the examples before me, and the lateral foveæ are only slightly marked. The front angles are more or less feeble and rounded. The elytra are distinctly striate, the striæ irregularly punctulate, the external ones having stronger and larger punctures than those near the suture, all the striæ and their punctures becoming more or less obsolete towards the apex. Each apex is separately and feebly rounded, the suture ending in a very small spine. The interstices are more or less closely punctured, more strongly in the male than the female. The sides of the prosternum are very strongly and sparingly punctured—(this is a highly distinctive character, and does not seem to vary). The antennæ of the male are shorter than in the large common South Australian species (*T. Australasiæ*, or possibly *Murrayi* if the two are really distinct), and the individual branches of the same are also shorter, though they are very distinctly longer than the distance between the bases of the antennæ. The tarsi also are notably shorter, especially in the male.

From *T. Fortnumi* (*vide* "supra") it differs chiefly in being much less attenuate behind, with the prothorax less rugulose dorsally; the sides of the prosternum much less closely punctulate; the branches of the antennæ in the male considerably longer, and the apical spines of the elytra much feebler.

TENEBRIONIDÆ.

LEPISPILUS.

L. rotundicollis, sp. nov. Oblongus; convexus; piceus; maculatim flavo-pubescens; prothoracis lateribus sinuatis, latitudine paulo ante medium quam trans basin haud minore. Long., 8 l.; lat., $3\frac{3}{5}$ l.

Differs from *L. sulcicollis*, Boisd., in the form of the prothorax, which is (by measurement) very nearly twice as wide as long (as 13 to 7 in the example before me), with the front about two-thirds the width of the base, the sides strongly convex in outline immediately behind the front, and from the middle to the base almost as strongly concave, so that the greatest divergence is at

the base and at a point a little in front of the middle. The closely punctulate depressions on the elytra bearing yellow pubescence are very shallow and very large, and are very irregularly placed, so that the nitid interspaces form an ill-defined and extremely open network, none of them appearing as continuous longitudinal costæ, even that nearest to the suture being more or less interrupted. It is not improbable, however, that there may be some variation in this respect if in some examples the depressed spaces happen to fall more into longitudinal lines. The average area of these closely punctured depressed spaces is about equal to that of the eye as seen from above, but in places two or three of them almost coalesce, so as to form what on a casual glance looks like a very large space indeed.

A single example in the South Australian Museum is ticketed "C. A." (Central Australia). Other specimens similarly ticketed seem to be from the southern part of the tropical region.

MELOIDÆ.

ZONITIS.

Z. nigro-ænea, Fairm., var. (?) *A*. Nigra; clypeo antice obscure piceo; elytris cœruleis, crassissime rugulose punctulatis, interstitiis haud lævigatis. Long., 6 l.; lat., $1\frac{4}{5}$ l.

The antennæ are two-thirds the length of the body; joint 1 is slightly longer than 4, 2 scarcely half as long as 1, and two-thirds the length of 3. The head is equal in length to the prothorax, and also to the first four joints taken together of the antennæ; the distance from eye to eye is rather more than the length of the basal joint of the antennæ, or about one-third the length of the head. The labrum is nearly as long as the basal joint of the antennæ, ciliated in front and deeply channelled down the middle, its surface shiny, with a few strong punctures. The clypeus is truncate in front, its hind suture strongly angulated; its surface is shining and only obscurely punctulate, a deep furrow crossing it near its base, its length about equal to that of the labrum. The hind part of the head is strongly and somewhat rugosely punctulate, and almost truncate behind. The prothorax down the middle is barely longer than its greatest width, which is slightly behind the middle; its base is about a quarter again as wide as the base of the head; the width of its front is about one-third of its base, from which the sides diverge sinuously not quite to the middle, where they are strongly rounded, and thence converge sinuously to the front; the front part of the suface is a little depressed; from this depressed space a very strong central channel runs back to the base, and on either side of the channel there is a large deep fovea on the disc. The scutellum is nitid, and very sparsely, but not finely, punctulate. The elytra are

extremely coarsely foveolate-punctulate, the instertices quite confused, with no tendency to a linear arrangement, and bearing confused punctures and wrinkles. In the male the basal three ventral segments are carinate down the middle, and the fourth is strongly and widely emarginate at the apex. The underside is rather closely (least closely on the hind body), squamosely, and finely punctured, and is densely clothed with black pubescence, the upper surface being glabrous.

Seems to be near *Z. nigro-ænea*, Fairm., but is larger, with the hind body of the male carinate (not "longitudinally impressed"), and with the scutellum and the elytral interstices punctulate.

If M. Fairemaire's description of *Z. nigro-ænea* can be relied upon, the insect described above is probably a distinct species. But unfortunately that author's "Revision des Zonitis d'Australie" contains errors (perhaps of the printer) which render it unsafe to give new names to species that seem closely allied to those that are described in it. In the description of *Z. indigacea (e.g.)* we read of the antennæ "articulo 2° tertio paulo longiore," but further on *indigacea* is distinguished from *nigro-ænea* by "the second joint notably shorter than the third."

Port Lincoln.

Z. Andersoni, sp. nov. ♀ Nigra, capite (labro excepto) rufo, elytris (apice excepta) testaceis, prothorace pedibusque brunneo-piceis; capite antice minus producto; elytris crebre subtilius punctulatis, obsolete costatis. Long., $7\frac{1}{2}$ l.; lat., $2\frac{4}{5}$ l.

The antennæ are about half as long as the whole body; joint 1 is rather short (little more than half as long as the distance between the eyes), 2 scarcely longer, 3 slightly longer still, 4 still longer (nearly half again as long as 1). The head is triangular, scarcely longer than the width of its base, which is gently arched hindward, its length about equal to that of the basal four joints of the antennæ together. The labrum is about as long as the clypeus (the two together being less than half as long as the rest of the head), its front portion declivous, its front margin ciliated, its surface feebly and sparingly punctulate and hairy, without any furrow. The hinder part of the clypeus is flat and horizontal, with a defined margin or ridge, the portion in front being declivous; the hind suture is feebly arched, its surface obscurely punctulate (most strongly on the ridge). The hinder part of the head is punctured rather strongly in front, very obscurely behind, with a feeble central longitudinal furrow running forward for a short distance from the base. The prothorax is scarcely wider than long, its front margin about a third as wide as the base and as the hind margin of the head; its sides diverge slightly and

scarcely sinuously to about the middle, where they are feebly rounded, and whence they converge bisinuately to the front; its surface is very finely and sparsely punctured, the front portion depressed; there is an interrupted and rather feeble channel down the middle of the hinder half; the base is very gently arched hindward; scutellum smooth behind, punctured in front. The elytra are closely, evenly, and rather finely punctulate, and bear (besides the raised suture) distinct traces of three or four costæ, which almost reach the apex. The metasternum is faintly punctulate, and bears a short, close, erect pile; the ventral segments are nitid, glabrous, and almost lævigate.

The bright red head, dark red-brown shining prothorax, and testaceous semi-opaque elytra, with their apex black, will render this species easy to recognise.

Allied to *Z. tricolor*, LeG., but (apart from colour) differing in its much shorter head, differently shaped clypeus and labrum, prothorax very much narrower in front, &c.

Port Lincoln; taken by Mr. J. Anderson.

Z. brevicornis, sp. nov. Rufa; antennis, palpis, mandibulis apice, femoribus anticis antice in medio, tibiis (basi exceptis), tarsis, macula in capite, maculis in prothorace 2, metasterno (episternis exceptis) et abdominis parte, piceo-nigris; elytris cæruleis, crebre subtilius (postice crassius) punctulatis; capite antice minus producto; prothorace antice minus angustato. Long., 5 l.; lat, $1\frac{4}{5}$ l.

The antennæ are about half as long as the whole body; joint 1 is short (scarcely as long as half the distance from eye to eye); 2, shorter still; 3 and 4 subequal, each of them equal to the basal joint. The head is not very triangular in shape, its length and breadth about equal, its length a little greater than that of the basal four antennal joints together. The labrum is scarcely so long as the clypeus (the two together not quite half as long as the rest of the head), its surface devoid of a dorsal furrow, strongly punctulate, its front ciliated. The clypeus is strongly punctulate, its hind suture strongly arched. The surface of the hind part of the head is punctulate strongly in front, and gradually less strongly hindward, and bears between the eyes a large piceous blotch, which is slightly protuberant and lævigate in the middle; the hind margin of the head is almost truncate. The prothorax is very slightly shorter than the head, very slightly wider than long, and equal in width to the hind margin of the head; its front margin (which is emarginate) is nearly half as wide as its base; its sides are gently and somewhat evenly arched, their greatest divergence being in front of the middle; its surface is strongly and very sparingly punctured, with some feeble indica-

tion of a dorsal channel a little in front of the base, and with a distinct round piceous discal blotch on either side a little in front of the middle. The elytra are closely subrugosely and rather finely punctured, the punctures much mixed up with a system of reticular wrinkling. The upper surface (saving some hairs on the labrum) is glabrous. The underside is distinctly, though rather lightly and squamosely, punctured; the metasternum bears a short erect closely-set pile. The claws are red. The middle tibiæ are strongly, almost angularly, bent (perhaps in the male only). The hind body is piceous, but bears a yellow patch (successively larger on each segment from the base) on either side of each segment. In the male the ventral segments are carinate all down the middle.

This species should fall, I think, into M. Fairemaire's first division of the genus, and will be the only species therein yet described having unicolorous blue elytra; its short thick antennæ also will distinguish it. A very old and faded example in the South Australian Museum seems to be identical, although the black spots on the head and prothorax are wanting.

Port Lincoln.

Z. cyanipennis, Pasc. The description of this species occupies four lines in the "Journal of Entomology." True, it is accompanied by an uncoloured figure, but, unfortunately, the figure appears to have been taken from a specimen with its head tucked down among the sterna, and gives little information beyond what the brief description furnishes; indeed, it rather presents a contradiction, for whereas the size given after the description is 6 l., the indicator in the plate gives $4\frac{3}{4}$ l., M. Fairemaire has provided a fuller description of an insect in his collection which he alleges (without specifying his authority) to be *cyanipennis*, Pasc., and gives its length as $8\frac{1}{2}$ mm., which means, I suppose, $4\frac{1}{4}$ l. I think M. Fairemaire's identification is possibly incorrect, both because he describes the colour (which appears to me remarkably constant in the metallic Zonites) differently from Mr. Pascoe, calling the elytra "blue-green" instead of "dark indigo-blue;" and because he says that the humeral calli are almost lævigate, which (if my identification of *Z. cyanipennis* is correct) certainly is not the case. Mr. Pascoe makes no allusion to the puncturation of any part of *cyanipennis*, so this important character gives no assistance. I have before me two specimens from Melbourne (the locality of the original type) coloured as *cyanipennis* is said to be, except in having the mesothoracic epimera yellow (of the length 6 l.). One of these—a female—agrees with Mr. Pascoe's figure in the shape of the elytra at the apex. The other (length, 4 l.) is a male, and seems perfectly identical with the larger specimen, except in respect of what appear to be sexual characters, viz.,

the antennæ are more slender (three-fifths the length of the whole body); the elytra are more narrowed, and are separately rounded at the apex, and the ventral segments are different, the basal three being compressed into a keel down the middle, and the fourth triangularly depressed in the middle.

The head in the insect which I take to be *cyanipennis*, Pasc., is nearly twice as long as its width across the base ; the labrum is quite as long as wide, is depressed down the middle, and bears a few strong setiferous punctures. I do not find any distinct separation between the hinder part of the head and anything that can be called a clypeus. The middle of a straight line drawn from the front of the labrum to the hind margin of the head would fall decidedly in front of the base of the antennæ. The antennæ are broken in the female example before me ; joint 1 is unusually long (equal to the basal joint of the front tarsi, and much more than half as long as the distance from eye to eye); 2, half as long as 1 ; 3 and 4 successively increasing in length ; but even 4 distinctly shorter than 1. The prothorax is scarcely longer than the head, is a little (to the eye it looks a good deal) longer than its greatest width, and is at its front margin rather more than a third the width of its base. The elytra are scarcely punctulate, but appear shagreened with fine vermiculate rugulosity somewhat as in *Z. rustica*.

Z. rustica, sp. nov. Rufa ; antennis, palpis, mandibulis, femoribus apice, tibiis, tarsis, capite toto, metasterno (episternis exceptis), et abdominis segmentis primis 3, nigris ; elytris cœruleis, crebre subtilius punctulatis, capite antice producto gradatim angustato ; prothorace fortius crebrius punctulato, antice sat fortiter angustato. Long., $4\frac{1}{2}$ l. ; lat., $1\frac{3}{5}$ l.

The antennæ scarcely exceed the length of half the body ; joint 1 is short (less than half as long as the distance from eye to eye), 2 scarcely half as long as 1, 3 slightly shorter than 1, 4 slightly shorter than 3. The head is very slightly longer than its width across the eyes, with its hind margin convex hindward ; it is gradually narrowed forward so as to be rather pointed in front, its width across the base of the mandibles is little less than half its width across the eyes ; its whole surface, including the labrum, is evenly, strongly, and rather closely punctulate, except that the puncturation becomes finer and feebler near the hind margin ; the labrum is rather strongly transverse, is clothed with long hairs, and bears a deep central fovea, much abbreviated in front. The prothorax is of the same length as the head, slightly longer than its greatest width, its front margin about half as wide as its base, its sides somewhat evenly rounded (scarcely perceptibly sinuate both in front of,

and behind, the middle), its greatest width (which is at the middle) scarcely exceeding the width of the head across the eyes, its surface evenly, somewhat strongly, and rather closely punctulate, with obscure traces of the middle part of a longitudinal dorsal furrow. The elytra on close examination are seen to be finely punctulate, but their readily noticeable sculpture consists of a confused system of wrinkling, making them appear finely shagreened, or coarsely coriaceous. To specify the degree of this sculpture by comparison with a familiar species, I may say that the general effect of the sculpture is a little less rough and strong than that on the elytra of *Z. bicolor*, Le G. The upper surface is glabrous or nearly so, the underside and legs densely clothed with short hairs. The claws are red, the ventral segments are coarsely, squamosely, and rather closely punctulate.

South Australia.

Z. Murrayi, sp. nov. ♂ Rufo-testacea; labro, palpis, antennis (basi picescenti excepta), femorum apice, tibiis, tarsis, metasterno (episternis exceptis), et abdominis segmentis basalibus 5 (5i apice rufo excepto), nigris; elytris læte cœruleis; capite nonnullis exemplis antice infuscato; hoc fortiter minus crebre punctulato antice minus producto minus angustato; prothorace canaliculato vix perspicue punctulato, antice sat fortiter angustato; elytris minus subtiliter vermiculato-punctulatis. Long., 5 l.; lat., $1\frac{2}{5}$ l.

The antennæ are about three fifths of the length of the whole body; joint 1 is piriform and strongly curved, in some examples testaceous, decidedly shorter than in *Z. cyanipennis*, scarcely longer than half the distance between the eyes, about as long as in *Z. rustica*, but much more strongly curved, joint 2 about one-third shorter, 3 equal to 1, 4 scarcely so long as 3. The head from the front of the labrum to the base is scarcely longer than its greatest width, the front part nearly parallel-sided; the middle of a line joining the front of the labrum, and the base of the head would fall between the insertions of the antennæ; the labrum is transverse and sulcate down the middle; the clypeal suture is quite undefined. The prothorax scarcely differs from that of *Z. cyanipennis*. The sculpture of the elytra is on the same plan as in *Z. cyanipennis* and *Z. rustica*, but is stronger, coarser, and less close than in either of them. The specimens before me appear to be all males, but (as usual in this genus) the soft hind body has become so much distorted in drying that its shape is not the same in any two. The first four or five ventral segments are compressed into a keel, which, however, does not always run down the exact middle line; the fifth is very feebly concave all across at the apex. The

ventral segments are very nitid, strongly and sparsely punctulate, and only thinly pubescent. The middle tibiæ are very strongly compressed and strongly curved; much more so than in *Z. cyanipennis*. The head is quite four-fifths as wide as the widest part of the prothorax.

Evidently must stand near to *Z. cyanipennis*, from which it differs in the yellow head nearly as wide as the prothorax, more coarsely sculptured elytra, much more nitid, strongly punctulate, and less pubescent ventral segments, &c.

Murray Bridge (South Australia); taken by Mr. Tepper.

Z. gloriosa, sp. nov. Piceo-brunnea obscure rufescens, elytris antice viridibus postice purpureo-violaceis; capite antice valde producto subtilius crebrius (disco lævi excepto) punctulato; prothorace vix perspicue canaliculato, leviter nec crebre vix subtiliter punctulato, antice rotundato-angustato; elytris subtiliter sat crebre nec rugulose punctulato. Long., 7 l.; lat., 3 l. (vix).

Considerably dilated behind. The apical part of the antennæ has been broken off the example before me; joint 1 equals 3, and is rather longer than 2 and shorter than 4. The head is more than one-third again as long as at the base it is wide, the front part parallel-sided; the middle of a line joining the base of the head and front of the labrum would fall considerably in front of the antennæ; the labrum is nearly as long as wide, its surface punctulate and longitudinally sulcate. The prothorax is slightly wider than long; its base is truncate, from which the sides diverge very slightly in nearly straight lines to immediately in front of the middle, where they are rounded, and whence they converge in a strong curve to the front, which is about half as wide as the base, but viewed from above the sides seem to pass into the front in a continuous curve; the surface bears no inequalities, except a barely discernible longitudinal furrow, which is abbreviated slightly in front. The puncturation of the elytra is considerably finer and less close than in *Z. tricolor*, Le Guill., and is not at all rugulose. The prothorax is slightly wider than the head, and scarcely half as wide as the widest part of the elytra. An obscure costa runs obliquely from close within the shoulder to the middle of the disc of the elytra.

Seems to resemble *Z. splendida*, Fairm., but that species is said to have a short triangular head, and the prothorax lævigate. The present species has the head exceptionally elongate—the anterior part being almost absolutely parallel-sided—and the prothorax distinctly punctured. It appears to me structurally nearer to *Z. cyanipennis*, Pasc., than to any other previously described species.

Port Lincoln district; taken by Mr. J. Anderson.

COCCINELLIDÆ.

NOVIUS.

N. ruber, sp. nov. Breviter ovalis; sat nitidus; pubescens; sanguineo-ruber, subtus distincte, supra vix perspicue, hic illic infuscatus; tarsis picesentibus; capite prothoraceque vix perspicue, elytris crebre subtilius, punctulatis. Long., $1\frac{1}{2}$ l.; lat., $1\frac{1}{5}$ l.

Much like *N. bellus*, Blackb., in form and sculpture, but decidedly larger, and very differently coloured. The whole upper surface is of a shining bright-red colour, almost like sealing-wax. On close inspection a little vague infuscation can be discerned running down the side of each elytron a little within the margin in the front half, and occupying the neighbourhood of the inner apical angle.

N. cardinalis, Muls., is a still larger species with the head black and the prothorax and elytra bearing conspicuous black markings. *N. sanguinolentus*, Muls., has the head, prothorax, and scutellum black. The upper surface of *N. Lindi*, Blackb., is entirely black, except a large red spot on each elytron. *N. cardinalis*, Muls., and *bellus*, Blackb., agree in having both prothorax and elytra red, with black markings; but the pattern of either is very different from that of the other.

Sent to me by Mr. T. G. Sloane; taken by him, I believe, at Mulwala, N.S.W.

ERRATUM.

Tr. Roy. Soc., 1887, p. 224, lines 7, 24, 28, 29, and 33, for "*Lindi*" read "*Sharpi*."

Notes on the Geographical Distribution of Australian Characeæ.

By Baron Sir F. von Mueller, F.R.S., &c.

[Read August 6, 1889.]

The following brief indications of the geographic range of various Australian Characeæ, which are additional to what is recorded in vol. xi. of my Fragm. Phytogr., Austral., pt. II., pp. 43-44, are from the researches of Dr. O. Nordstedt, chiefly through material communicated from the Melbourne Phytologic Museum :—

Chara contraria, *Al. Br.*:—Victoria; South Australia (Lake Bonney, *Miss Wehl;* Kangaroo Island, *O. Tepper).*

Chara coronata : — Victoria; Queensland; South Australia (Pidinga, *W. Tietkins).*

Chara dichopitys :—Victoria and New South Wales.

Chara fragilis, *Desv.* :—W. Australia; New South Wales; Queensland.

Chara gymnopitys, *Al. Br.* :—S. Australia (Kangaroo Island, *O. Tepper);* V.; N.S.W.; N.A.

Chara gymnopus :—W.A.; T., V.; N.S.W.; Q.; N.A.

Chara leptopitys, *Al. Br.* :—S.A. (Lake Bonney, *Miss Wehl);* Victoria.

Chara macropogon, *Al. Br.* :—W.A.; Q.; S.A. (Kangaroo Island, *O. Tepper).*

Chara Muelleri, *Al. Br.* :—Victoria.

Chara submollusca, *Nordstedt* (n. sp.) :—Queensland.

Nitella conglobata :—W.A.; V.; N.S.W.; Q.; N.A.

Nitella cristata :—S.A. (Tatiara-country, *C. Walter);* T.; N.S.W.; Q.

Nitella diffusa :—Victoria; New South Wales.

Nitella gracilis :—S. Australia (Murray River, *F. v. M);* Victoria.

Nitella Gunnii, *Al. Br.* :—V.; N.S.W.; Q.

Nitella hyalina :—W.A.; V.; Q.; N.A.

Nitella interrupta :—S.A.; T.; V.; N.S.W.; Q.

Nitella leptostachys, *Al. Br.* :—S.A. (among Todeas above the cataract of Mount Lofty, *F. v. M.*, 1848).

Nitella microphylla, *Al. Br.* :—W.A.; T.

Nitella myriotricha, *Al. Br.* :—S.A. (Murray River).

Nitella polyglochin :—Queensland.

Nitella Sonderi, *Al. Br.* :—N.S.W.; N.A.

Nitella Tasmanica, *F. v. M.* :—Victoria; Queensland.

Notes on Australian Fungi.

Collated by J. G. O. Tepper, F.L.S.

[Read August 6th, 1889].

List of Fungi, New or Rare for South Australia.

The following species were collected by Mr. J. G. O. Tepper, and named by Prof. P. Andrea Saccardo, of Padua, through the kindness of Dr. F. Ludwig, Germany :—

Uromyces Tepperianus, *Sacc., sp. n.* On *Acacia salicina.* It attacks the younger branches, causing fusiform swellings several inches in length, and in the middle two to four times the diameter of the branch. The bark bursts finally in several places, and the brown spores thickly cover the surface of the wounds. The branches, and finally the shrub, so attacked die after one to three years, or support life in a stunted form to an indefinite extent.

Black Hill, N.E. of Adelaide ; Sandy Cr., Callington. October to November, 1887.

Dimerosporium Ludwigianum, *Sacc., sp. n.* On *Lagenophora Billardieri*, forming raised pustules on the leaves; spores ferruginous. Common in open woody hill districts.

Clarendon, Angaston, &c., November, 1887.

Capnodium elongatum, *B. & D.* It is distributed over the leaves of some species of Acacia.

Williamstown, October, 1888.

Chætomium comatum *(Tode), Fr.* A black rust upon straw, Norwood, 1888.

Septoria Bromi, *Sacc.* On the leaves of *Kœleria phleoides* (an introduced grass).

Murray Bridge, November 1887.

Heterobotrys paradoxa, *Sacc., gen.* and *sp. n.* Dr. Ludwig states that it was found on all specimens of *Bertya rotundifolia*, a Kangaroo Island plant.

The following remarks are taken from letters and publications by Dr. Ludwig, in the "Bot. Central Blatt," No. 11, 1888 :—"The leaves of this small shrub are rough, of a dull dark green, and densely covered by minute hairlets of a peculiar structure. The

stalk or erect portion is from 300 to 350 u in length, and 30 to 50 u thick, and from its apex radiates a whorl of ten to twenty bristly, one-celled branches, of about the same length, but in average only three to five u thick (excepting the much stouter base), which are placed at right angles to the stalk." "In the stalk of these stellar hairs appears to be the principal seat of the fungus, for it is frequently so much invaded by it that very little of the original contents remains. Arriving at the summit the fungal threads grow spirally around the bristle-like stellar branches, frequently occupying all in the whorl, and twisting around them as closely and regularly as 'beans or hops around the poles' When developed luxuriously the threads branch and anastomose profusely, producing parcels of brown accumulated cells, which impart a still darker tint to the leaves and other parts. All that remains finally are small heaps of globular spores of five to six u diameter, adhering to some of the bristles. The spiral twist of this microscopic climber is from left to right almost unexceptionally; occasionally some of the bristles themselves are so twisted, or several together, but this may be due to the screw-like growth of the fungus." "The mycelium likewise invades the leaf structure, frequently filling the cells and destroying the epidermis, when it imparts to these parts a blackish tint, which is owing to the colour of the threads and spores. In this character it exhibits affinity to *Fumago salicina*, and probably also to *Pleospora herbraum*."

Stereum hirsutum, *Fr.*, *var. aurantium.* A pale orange-coloured woody fungus on old bark of the Sheaoak, *Casuarina quadrivalvis.*

Mount Lofty Ranges, August, 1887. A well-known species, but the locality and host are probably new.

Stereum amœnum (*Leo.*), *Sacc.*

Mount Lofty Ranges. The species appears to be new for the province.

Polystictis ornamomeus, *Sacc.* On rotten timber of Stringy-bark, *Eucalyptus obliqua.*

Mount Lofty Ranges, August, 1887. This species is new for the province.

Polystictis sanguineus (*L.*), *Fr.*

Lake Eyre, Pandappa, August 2, 1887.

Trametes hispidula, *Berk.* An orange-coloured widely looped fungus, living on the ground or very rotten timber in the sandy scrub.

Williamstown, October, 1888. Species new for South Australia.

Cyphella polycephala, *Sacc., sp. nov.* On dry twigs of *Senecio hypoleucus*, a suffruticose composite plant common on the hillsides near Adelaide.

The specimen sent was taken from a shrub cultivated in my garden at Norwood, August, 1887.

Panus lateritius, *Sacc., sp. nov.* Upon rotten wood of *Eucalyptus corynocalyx*, or sugar gum.

Karatta, Kangaroo Island, November, 1886.

Nummularia pusilla, *Sacc., sp. nov.* It forms raised round pustules of intense black colour, and thickly studding rotten stems of *Bursaria spinosa*, which give the appearance as if the sticks were carbonised by a bush fire.

List of Australian Ustilaginæ, with Description of and Remarks about a New South Australian Species.

The Ustilaginæ, or Smuts, form an important section of fungi (Coniomycetes), inasmuch as many of them prove destructive to grasses and cereals useful or indispensable to man.

The following is a list of those known from Australia according to Dr. F. Ludwig, which is remarkable for its paucity. Of the 400 species known, 86 occur in Germany alone, hence the above-named specialist directs the attention of Australians to this section as offering a wide field of discovery. I collate Dr. Ludwig's list with Dr. Cooke's from 1880 to show the modifications and additions, distinguishing those of the latter left out from the former by enclosure in brackets, and the additions by an asterisk.

* Ustilago australis, *Cke.*, in spikelets of *Eriachne*; Trop. Australia.

" (carbo, *Tulasne*; Queensland).

" Muelleriana, *Thuemen;* in seeds of *Juncus planifolius;* V., S.A.

* " fimbristylis, *Thuemen;* in ripe seeds of *Fimbristylis;* Trop. Australia.

" marmorata, *Berkeley;* upon leaves of *Isolepis inundata;* S.A., V.

" bromivora *(Tul.) Winter;* in flowers of *Triraphis mollis;* S.A., V., N.S.W.

" segetum *(Bull., Ditm.), Winter;* in flowering spikelets of *Avena sativa;* Q.

" solida, *Berkeley;* upon *Schœnus imberbis;* V., N.S.W.

Ustilago utriculosa *(Mont., Nees), Winter :* in the flowers of *Polygonum minus ;* V., S.A. ?

" (Emodensis, *Berkeley ;* Q.).

" (bullata, *Berkeley ;* S.A., V., N.S.W.).

" (piluliformis, *Tulasne ;* V.).

* " Tepperi, *Ludwig, sp. nov.*

Spores powder-like, black, replacing more or less completely the flowering panicle and other parts above the rootstock, form spheroidal or shortly elliptical, diameter=12-17 u ; colour, deep brown ; epispores papillose to aculeate.

Habitat.—South Australia.

This smut attacks *Amphipogon strictum, Neurachne alopecuroides* and *Danthonia penicillata*, and is at times quite common. It has been observed at Ardrossan (Yorke's Peninsula), Callington, Clarendon, and about Adelaide from about the end of September to December.

Cintractea (Ustilago) axicola, *Berkeley ;* in panicles and fruits of *Cyperus, Fimbristylis*, and *Scirpus ;* Queensland.

* Doassansia punctiformis, *Winter ;* upon leaves of *Lythrum hyssopifolium ;* S.A. ?

* Thecaphora globuligera, *Berk. & Br. :* in the glumes of *Leersia hexandra ;* N.S.W., Q.

Sorasporium Muellerianum, *Thuemen ;* in the panicles of *Cladium filum ;* V. (S.A. ?).

" Eriachnis, *Thuemen ;* in the spikelets of *Eriachne ;* Q.

* Cerebella Paspali, *Cke. & Mass. ;* upon *Paspalum scrobiculatum ;* Trop. Australia.

ABSTRACT OF PROCEEDINGS

OF THE

Royal Society of South Australia,

FOR 1888-89.

ORDINARY MEETING, NOVEMBER 6, 1888.

Prof. RENNIE in the chair.

EXHIBITS.—J. G. O. TEPPER. F.L.S., showed some metamorphic rocks from the ranges between Williamstown and the South Para. J. J. EAST showed geological specimens from the McDonnell Ranges and adjacent parts of Central Australia.

MOTION.—J. G. O. TEPPER, F.L.S., moved, and S. DIXON seconded—"That the recommendations made by the Field Naturalists' Section with regard to the better preservation and protection of the Native Flora and Fauna of South Australia be adopted by the Society." Carried.

RECOMMENDATIONS OF THE FIELD NATURALISTS' SECTION.

That with the view of obtaining the better protection of our Native Fauna and Flora the Government should be asked—

1. To amend the Game Act, 1886 :—
   - *a.* By extending its operation to the whole colony, including islands.
   - *b.* By totally protecting in the State Forests all indigenous animals, save such as are found to be of an injurious character, for whose destruction licenses may be issued by the Conservator of Forests.
   - *c.* By totally protecting, as a general rule, all harmless mammals and insectivorous birds indigenous to the colony.
2. To give due notice to the public every year, either by means of placards or otherwise, of the amount of protection afforded by law to our native animals.
3. To place diagrams, descriptive of the habits of native insectivorous birds and harmless mammals, and to give instruction with regard thereto in the public schools.
4. To vest Government Farm, Belair, and the unsold lands around Mount Crawford in trustees, consisting of representatives of science, horticulture, and labour, for the purposes of National Parks and Preserves for the indigenous Fauna and Flora.

S. DIXON moved, and W. HOWCHIN, F.G.S., seconded—"That the President (Prof. Rennie) be the representative of the Society

on a deputation to the Minister of Education with reference to the instruction of children in matters relating to the native flora and fauna." Carried.

PAPERS.—"The Occurrence of Coal Detritus in the Valley of the Murray," by W. HOWCHIN, F.G.S.

ORDINARY MEETING, DECEMBER 4, 1888.

Prof. RENNIE in the chair.

BALLOT.—John Dennant, F.G.S., was elected a Corresponding Member.

EXHIBITS.—A. ZIETZ showed a collection of native weapons from various parts of the Australian Colonies.

ANNOUNCEMENT.—Prof. TATE, F.G.S., informed the meeting that the Government of South Australia had determined to print and publish from his manuscript a "Handbook of the Flora of South Australia."

PAPERS.—"Notes on some Freshwater Cretaceous Fossils from Central Australia," by Prof. TATE, F.G.S.; "A Revision of the Flora of Kangaroo Island," by Prof. TATE, F.G.S.

ORDINARY MEETING, FEBRUARY 5, 1889.

J. S. LLOYD, Esq., in the chair.

EXHIBITS.—Rev. H. KEMPE forwarded some ants from the River Finke, which were provided with sacs filled with a sweet fluid. D. J. ADCOCK showed what was probably a coccid on a seed-capsule of a eucalypt, from Daly Waters.

PAPERS.—"Foraminifera of the Older Tertiaries of Australia; part. i., Muddy Creek," by W. HOWCHIN, F.G.S. "The Cyclostomata of South Australia," by A. ZIETZ.

ORDINARY MEETING, MARCH 4, 1889.

Prof. RENNIE in the chair.

EXHIBITS.—J. G. O. TEPPER, F.L.S., showed a collection of rare moths, including *Opsirhina*, sp. (?), from Terowie, and *Chærocampa*, sp. nov., from Silverton, and *Pinara cana*; also two new fungi, *Battarea Tepperi* (Ludwig) and *Ustilago Tepperi* (Ludwig). A. ZIETZ showed a new Snake for South Australia, *Furina Ramsayi*, from Hergott Springs.

PAPERS.—"Outcrops of Granatoid Rocks on the Murray Flats, not hitherto mapped," by W. HOWCHIN, F.G.S. "Industrial Applications of Dynamo-Electricity," by C. Umbehaun.

Ordinary Meeting, April 2, 1889.

Prof. Rennie in the chair.

Exhibits.—D. B. Adamson laid on the table some photographs of the moon. A. Zietz showed a large specimen of the deaf-adder, 32 in. long. J. G. O. Tepper, F.L.S., showed some rare fungi found in South Australia. W. Rutt, C.E., showed a specimen of petrified wood from a bed of gypsum in the reservoir at Irrappatonna, 10 miles north of the Peake Creek. Prof. Tate showed a sample of native sulphur found in an auriferous reef near Oakbank containing iron pyrites. W. T. Bednall showed a rare moth.

Paper.—"Geological Structure and Physical Features of Central Australia," by J. J. East.

Ordinary Meeting, May 7, 1889.

Prof. Rennie in the chair.

Ballot.—Joseph Vardon, J.P., was elected a Fellow.

Exhibits.—J. G. O. Tepper, F.L.S., showed specimens of *Pielus* moths.

Discussion.—On Mr. J. J. East's paper read at the April meeting, in which Mr. Howchin, F.G.S., and Mr. J. Lindsay took part.

Ordinary Meeting, June 7, 1889.

Dr. Whittell in the chair.

Ballot.—J. C. Fraser was elected a Fellow.

Exhibits.—J. G. O. Tepper, F.L.S., showed some new species of *Locustidæ*. A. Zietz showed some native implements found near Milang; also some new fishes from the overflow of the borehole at Strangways Springs.

Paper.—"On some South Australian *Polyzoa*," by P. H. McGillivray, M.R.C.S., F.L.S., &c.

Ordinary Meeting, July 2, 1889.

Prof. Rennie in the chair.

Exhibits.—J. G. O. Tepper, F.L.S., showed large seeds from Beltana, which might belong to a species of *Cycas*: also a hard species of fungus allied to the *Polyporidæ*, and a liverwort, *Marchantia cephalocypha* (Ludwig); also a small moth from Beltana, probably new, and a large brown-coloured one with bristles, genus and species unknown. A. Zietz showed a collection of South Australian *Polyzoa*. Prof. Tate showed specimens

of *Campotropus inflatus*, from Hermansburg, Central Australia, sent by the Rev. H. Kempe.

Papers.—"Plant-Bearing Strata in Central Australia," by Prof. Tate, F.G.S. "Notes on some Rumbling Sounds heard at Gill's Bluff," by F. D. Johnson. July 9, 1888, 10.30 p.m.—Rumbling sound like blowing off of steam from a large boiler, lasting about forty seconds. July 22, 7 p.m.—Heard a similar noise. July 30, 10.50 p.m.—Rolling sound from the same quarter as on the previous occasions; lasted about 30 seconds. October 22, 10.30 p.m.—Rolling kind of noise for a few seconds. November 21, 8 p.m.—Slight rumbling sound. This was heard also by Mr. Rose, a prospector, who got up and questioned some natives camped alongside, who replied, "That one, along a ground." February 14, 1889, 10.40 p.m.—Loud rumbling sound, heard by the men in the camp. April 24, 1889, 6.30 p.m.—Low rumbling sound for half a minute. The evenings were invariably calm and clear, and gave no indications of any atmospheric disturbance.

Ordinary Meeting, August 6, 1889.

Prof. Rennie in the chair.

Ballot.—P. H. McGillivray was elected a Corresponding Member.

Communication.—Prof. Rennie read a notice giving particulars of the next meeting of the Australasian Association for the Advancement of Science in Melbourne, January 7, 1890.

Exhibits.—A. Zietz showed a living specimen of *Dromicia concinna*; also a new fish *(Cyttus australis)*; also a rare night lizard *(Nephrurus platyurus)*. J. G. O. Tepper, F.L.S., showed some locusts from Warrina, sent by Dr. Kennedy.

Papers.—"Notes on *Heterobotrys paradoxa*, found on *Bertya rotundifolia*," by Dr. F. Ludwig; also by the same, "Notes on some new Australian Ustilaginæ." Both papers on specimens forwarded by J. G. O. Tepper, F.L.S., who communicated the papers. "Additions to the Australian Characeæ," by Baron v. Mueller, K.C.M.G.

Ordinary Meeting, September 10, 1889.

Prof. Tate in the chair.

Exhibits.—J. G. O. Tepper, F.L.S., a collection of plants from Roebuck Bay, Western Australia. J. J. East showed some geological specimens collected by W. T. Tietkins, F.R.G.S., in Central Australia.

Motion.—J. G. O. Tepper, F.L.S., moved, and S. Dixon seconded—"That this Society acquiesces in and supports the

action of the Field Naturalists' Section respecting the permanent dedication of large tracts of land for the conservation of the native flora and fauna, and also general forest culture upon scientific, hygienic, and economic principles." Carried.

Papers.—"Notes on a Pentateuchal Roll," by F. W. Pennefather, LL.B., &c. "Notes on certain Pores on the Wings of some Dipterous Insects," by Frazer S. Crawford.

Dr. Stirling announced that he would shortly submit a full diagnosis of the newly-discovered mammal, referred to in last year's volume of the Transactions, to which he gives the name of *Psammoryctes typhlops*, gen. et spec. nov.

Annual Meeting, October 1, 1889.

Prof. Rennie in the chair.

Auditor.—D. J. Adcock was proposed and elected to audit the accounts for the past season.

The annual report and balance-sheet were read, adopted, and ordered to be printed.

The annual reports and balance-sheets of the Field Naturalists' and Microscopical Sections were read and accepted.

Election of Council.—The nomination and election of officers for the ensuing year was as follows:—President, E. C. Stirling, M.D.; Vice-Presidents, H. T. Whittell, M.D., and Rev. Thos. Blackburn, B.A.; Hon. Treasurer, W. Rutt, C.E.; Hon. Secretary, W. L. Cleland, M.B.; Members of Council, Prof. Tate, F.G.S., Professor Rennie, D.Sc., D. B. Adamson, Samuel Dixon, W. Howchin, F.G.S., W. B. Poole.

President's Address.—Prof. Rennie, D.Sc., gave an address "On some Recent Advances in Chemical Classification."

Papers.—"Additions to South Australian Coleoptera, by Rev. Thomas Blackburn, B.A. "Systematic Census of South Australian Plants," by Prof. Tate, F.G.S. "Gums and Resins of Australian Proteaceæ," by J. H. Maiden, F.L.S. "New Species of South Australian Plants," by Prof. Tate, F.G.S.

ANNUAL REPORT.

The Council has the pleasure of reporting that the work of the Society has been carried on successfully during the past year. The following papers have been laid before the Society:—"Notes on some Freshwater Cretaceous Fossils from Central Australia (Lake Eyre)," by Prof. Tate, F.G.S.; "A revision of the Flora of Kangaroo Island," by Prof. Tate, F.G.S.; "Foraminifera of the Older Tertiaries of Australia, Part I., Muddy Creek, Victoria," by W. Howchin, F.G.S.; "The Cyclostomata of South Australia," by A. Zietz; "On some Outcrops of Granitoid Rocks on the Murray Flats, not hitherto mapped," by W. Howchin, F.G.S.; "Industrial Applications of Dynamo-Electricity," by C. Umbehaun; "Geological Structure and Physical Features of Central Australia," by J. J. East; "On some South Australian Polyzoa," by P. H. McGillivray, M.R.C.S., F.L.S.; "Plant-bearing Strata in Central Australia," by Prof. Tate, F.G.S.; "List of Australian Ustilaginæ, with description of a new species," by J. G. O. Tepper, F.L.S.; "Additions to Australian Characeæ," by Baron v. Mueller; "Fragment of a Pentateuchal Roll," by Mr. Pennefather, LL.B.; "Notes on Certain Pores upon the Wings of Dipterous Insects," by F. S. Crawford; "Gums and Resins of Australian Proteaceæ," by J. H. Maiden, F.L.S.; "Notes on *Heterobotrys paradoxa*," by J. G. O. Tepper, F.L.S.; "New Australian Coleoptera," by Thos. Blackburn, B.A.; "Definitions of four New Species of Plants," by Prof. Tate, F.G.S.; "Revised Census of South Australian Plants," by Prof. Tate, F.G.S.

During the year there have been presented to the notice of the Fellows and members many new and interesting exhibits of natural history, chiefly through the instrumentality of Mr. J. G. O. Tepper, F.L.S., and A. Zietz, both of the Adelaide Museum.

His Excellency the Earl of Kintore has consented to be Vice-Patron.

The membership of the Society consists of 94 Fellows, eleven Hon. Fellows, seventeen Corresponding Members, and two Associates. During the year two new Fellows have been elected, and two new Corresponding Members, namely, John Dennant, F.G.S. (Victoria), and P. H. McGillivray, M.R.C.S. (Victoria). No Fellow or member has died during the year, but there have been several resignations from varying causes.

The reports of the two Sections of the Sooiety, namely, the

Field Naturalists' and Microscopical Sections, show continued vitality, and that they are self-supporting. The report of the Sub-Committee of the Field Naturalists' Section on the Preservation of the Native Flora and Fauna is of especial interest and importance, and the efforts being made in this direction should have the hearty co-operation, not only of the members of the Society, but of all lovers and students of Nature. It is to be regretted that so much ignorant apathy has yet to be overcome, but persistence in the end cannot fail to vanquish even that obstacle.

During the year the Library of the Society has continued to be enriched by numerous periodical exchanges and valuable monographs, a list of which appears elsewhere. Some new European exchanges have been authorised during the past year.

It is with great satisfaction that the Council is able to announce that within a few days Prof. Tate's "Handbook on the South Australian Flora" will be published. This is a want that has been long needed; and the appearance of such a work will give a great stimulus to botanical study. It will enable those who hitherto have had to be content with playing the rôle of simple collectors to become botanists; and as a consequence they will become still better collectors, because of their increased scientific knowledge. Even to the fortunate possessors of Bentham's "Flora Australiensis," the new work will be welcome, as it contains descriptions of numerous plants that have been discovered since the publication of that great opus. Prof. Tate's extensive experience as a teacher and a scientific botanist have enabled him to combine qualities not often united, and the valuable effect of these are to be seen in the descriptions of the diagnostic characters of plants.

THE TREASURER IN ACCOUNT WITH THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Dr.	£	s.	d.	£	s.	d.
October 1, 1888.						
To Balance				256	18	7
" Subscriptions—Royal Society ..	89	15	6			
Field Naturalists' Section	23	0	0			
Microscopical Section ..	7	5	0			
				120	0	6
" Government Grant				136	13	0
" Interest				8	11	2
" Sale of Transactions				1	2	6
				£523	5	9

Cr.	£	s.	d.	£	s.	d.
By Cost of Transactions—						
Printing and Binding	95	10	10			
Illustrating	50	8	0			
Editing and Publishing ..	4	1	0			
				149	19	10
" Salary of Assistant Secretary ..				21	0	0
" Advertising				4	14	6
" Printing, Postage, Stamp Tax, and Stationery				13	17	8
" Grant to Field Naturalists' Section ..				25	0	0
" " Microscopical Section ..				7	5	0
" Library - Binding				7	9	0
" Balance—Bank of South Australia ..	58	4	2			
Savings Bank	234	14	8			
In Hon. Secretary's hands ..	1	0	0			
In Treasurer's hands ..	0	0	5			
				293	19	3
				£523	5	9

Audited and found correct,

D. J. ADCOCK, Auditor.

October 1st, 1889.

WALTER RUTT, Hon. Treasurer.

30th September, 1889.

DONATIONS TO THE LIBRARY

For the Year 1888-9.

I.—Transactions, Journals, and Reports.

Presented by the respective Societies, Editors, and Governments.

Baltimore—American Chemical Journal; vol. IX., Nos. 4 to 6; vol. X., Nos. 1 to 6.

——— Johns-Hopkins' University Studies; fifth series, Nos. 8 to 12; seventh series, No. 1.

——— Johns-Hopkins' University Circulars; Nos. 58 to 63, and 65 to 67.

Batavia — Naturrkundig-Tijdschrift voor Nederlandsch-Indie; Achtste Serie, Deel IX.

Belfast (Ireland)—Report and Proceedings of the Belfast Natural History and Philosophical Society for 1887-8.

Belgium—Annales de la Société Belgique; tomes 16 to 22.

Berlin—Sitzungsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin; 1888; Nos. 21 to 52.

——— Königlich Preussischen Meteorologischen Institut—Instruktion für die Beobachter an den Meteorologischen Stationen II., III., und IV. Ordnung.

——— Ergebnisse der Meteorologischen Beobachtungen im Jahre, 1887.

Bonn—Verhandlungen des Naturhistorischen Vereines der Preussischen Rheinlande, Westfalens und des Reg.-Bezirks, Osnabrück; part 2, 1886; 1887-8; part 1, 1889.

Boston—Memoirs of the Boston Society of Natural History; vol. IV., Nos. 1 to 6.

——— Proceedings of the American Academy of Sciences; part 1, vol. XXII.; part 2, vol. XXIII.

——— Proceedings of the Boston Society of Natural Sciences; vol. XXIII., parts 3 and 4.

Buenos Ayres—Boletin de la Academia Nacional de Ciencias en Cordoba (Republica Argentina); vol. XI., 1888.

California—Bulletin of the Californian Academy of Sciences (San Francisco); vol. II., No. 8.

California—Memoirs of the Californian Academy of Sciences; vol. II., No. 1.

Cambridge (U.S.A.)—Bulletins of the Museum of Comparative Zoology at Harvard College; vol. XIV.; vol. XV.; vol. XVI., Nos. 2 to 5; vol. XVII., Nos. 2 and 3.

Canada—The Canadian Record of Science; vol. III., Nos. 3 to 6 (Montreal).

——— Catalogue of Canadian Plants; part 5.

Cape Town—Transactions of the South African Philosophical Society; vols. I., II.; vol. IV.; vol. V., part 1; 1877-88.

Chili—Verhandlungen des Deutschen Wissenschaften Vereins zu Santiago, 1888.

Connecticut (America)—Transactions of the Meriden Scientific Association; vol. II., 1885-6; vol. III.

Costa-Rica—Anales dei Museo Nacional (San José); vol. I., 1887.

Edinburgh—Proceedings of the Royal Society of Edinburgh, for the years 1883-7.

———— Proceedings of the Royal Physical Society, 1887-8.

Geneva—Compte Rendu des Séances de la Société de Physique et d'Histoire Naturelle de Genève; V., 1889.

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——————— Results of Meteorological Observations made in New South Wales in 1886. By H. C. Russell, B.A.

——————— Rain, River, and Evaporation Observations made in New South Wales during 1887. By H. C. Russell, B.A., &c.

——————— Proceedings of the Linnean Society of New South Wales; second series; vol. III., parts 3, 4; vol. IV., parts 1, 2.

——————— List of Errata in the Catalogue of the Australia Scyphomedusæ and Hydromedusæ. By R. von Lendenfeld, Ph. Dr., &c.

——————— Tabular List of all the Australian Birds known to the Author. By E. P. Ramsay, Curator of the Australian Museum.

——————— Minerals of New South Wales. By A. Leversidge, F.R.S.

——————— Journal and Proceedings of the Royal Society of New South Wales; vol. XXII., part 2.

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——————— The Source of the Underground Water in the Western Districts. By H. C. Russell, B.A., F.R.A.S., &c.

——————— Results of Rain, River, and Evaporation Observations in New South Wales. By H. C. Russell, B.A., F.R.A.S., &c.

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——————— The Comparative Danger to Life of the Alternating and Continuous Electrical Currents. By Harold P. Brown.

New Zealand—Report of the Auckland Institute and Museum for 1888-89.

———— Transactions and Proceedings of the New Zealand Institute, 1888; vol. XXI.

———— Reports of Geological Explorations during 1887-8; No. 19; Colonial Museum and Geological Survey of New Zealand.

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————————Report on a Journey from Adelaide to Hale River, by H. Y. L. Brown, Govt. Geologist.

————————Report upon the Progress and Condition of the Botanic Garden for 1888.

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della R. Universita di Torino ; vol. III., parts 49 to 66.

Victoria—The Victorian Naturalist ; vol. V., Nos. 7 to 12 ; vol. VI., Nos. 1 to 5.

——— Transactions of the Geological Society of Victoria ; vol. I., parts 1 and 2.

——— Prodromus of the Palæontology of Victoria. By Frederick McCoy, F.G.S., &c. Decades VI. and VII.

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——— Iconography of the Australian Species of Acacia and Cognate Genera. Baron F. von Mueller. Decade XIII.

——— Key to the System of Victorian Plants. By F. von Mueller ; vols. I. and II.

——— Select Extra-Tropical Plants, &c. Seventh edition. By F. von. Mueller.

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——— Results of Astronomical Observations made at the Melbourne University in 1881-2-3-4. By R. L. J. Ellery, F.R.S., F.R.A.S.

——— Catalogue of Oil Paintings, &c., in the National Gallery of Victoria.

Vienna—Verhandlungen der K. K. Geologischen Reichenstalt, 1887, Nos. 1 to 16 ; 1888, Nos. 12 to 14 ; 1889, Nos. 1 to 9.

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———Annual Report of the Board of Regents of the Smithsonian Institution to July, 1885, part 2.

———Compilation of Notes and Memoranda bearing upon the Use of Human Ordure and Human Urine in Rites

of a Religious or Semi-Religious Character among Various Nations.

Washington (U.S.A.)—Bibliography of the Siouian Language. By J. C. Pilling.

———————————Bibliography of the Eskimo Language. By J. C. Pilling.

———————————The Use of Gold and other Metals among the Ancient Inhabitants of Chiriqui, Isthmus of Panama. By Wm. H. Holmes.

———————————Work of Mound Exploration of the Bureau of Ethnology. By Cyms Thomas.

———————————Perforated Stones from California. By Hy. W. Henshaw.

By U.S. Geological Survey :—

———————————Mineral Resources of the United States. By David T. Day.

———————————Monographs—XII.—Geology and Mining Industry of Leadville, with Atlas.

———————————Bulletins, Nos. 40 to 47.

———————————Mineral Resources of the United States, year 1887.

LIST OF FELLOWS, MEMBERS, &c.

November, 1889.

Those marked (F) were present at the first meeting when the Society was founded. Those marked (L) are Life Fellows Those marked with an asterisk have contributed papers published in the Society's Transactions.

HONORARY FELLOWS.

		Date of Election
Barkely, Sir Henry, K.C.M.G., K.C.B.	...	1857
Ellery, R. L. J., F.R.S.	Melbourne	1876
Garran, A., L.L.D.	Sydney	1853
Hull, H. M.	Hobart	1855
Jervois, Sir W. F. D., K.C.M.G., C.B.	New Zealand	1878
Little, E.	... ...	1858
Macleay, Sir W., F.L.S.	Sydney	1878
*Mueller, Baron F. von, K.C.M.G., F.R.S.	Melbourne	1879
Russell, H. C., B.A., F.R.A.S. ...	Sydney	1876

CORRESPONDING MEMBERS.

Bailey, F. M., F.L.S.	Brisbane	1881
Canham, J.	Stuart's Creek... ...	1880
*Cloud, T. C., F.C.S.	Wallaroo	1881
*Dennant, J., F.G.S.	Melbourne	1888
*East, J. J.	Prospect	1884
*Foelsche, Paul	Palmerston	1882
Goldstein, J. R. Y.	Melbourne	1888
*Hayter, H. H., M.A., C.M.G., F.S,S.	Melbourne	1878
Holtze, Maurice	Palmerston	1882
*Kempe, Rev. J.	Finke	1880
*McGillivray, P. H., M.R.C.S., F.L.S.	Sandhurst	1889
*Maskell, W. M., ...	New Zealand	1888
Nicolay, Rev. C. G.	Fremantle, W.A. ...	1886
*Richards, Mrs. A.	Beltana	1880
*Stirling, James, F.L.S., F.G.S. ...	Melbourne	1883

FELLOWS.

*Adamson, D. B.	Adelaide	1867
Adcock, D. J.	Adelaide	1887
Angas, J. H.	Angaston	1874
Angove, W. T., M.R.C.S. ...	Tea Tree Gully ...	1888
Bagot, John	Adelaide	1887
*Blackburn, Rev. Thomas, M.A. ...	Woodville	1887
Boettger, Otto	Adelaide	1884
Bragg, Prof., M.A.	Adelaide	1886
Brown, J. E., F.L.S.	Adelaide	1881
Brown, L. G.	Two Wells	1882
*Brown, H. Y. L., F.G.S.	Adelaide	1883
Bussell, J. W....	Adelaide	1884

Campbell, Honorable Allan, M.L.C., L.R.C.P., Edin.	Adelaide	1882
Chapman, R. W., B.Sc	Adelaide	1888
*Cleland, W. L., M.B., Ch M., F.R.M.S.	Parkside	1879
(L) Cooke, E.	Adelaide	1876
Cox, W. C.	Semaphore	1880
*Crawford, F. S.	Adelaide	1865
Davis, F. W.	Adelaide	1882
*Dixon, Samuel	Adelaide	1887
Dobbie, A. W.	Adelaide	1876
Elder, Sir Thomas	Adelaide	1871
Eyres, Thomas...	Adelaide	1887
Fleming David...	North Adelaide ...	1886
Fletcher, Rev. W. R., M.A. ...	Kent Town	1876
Foote, H.	Outalpa	1883
Fowler, W.	Kulpara	1882
Fraser, J. C.	Adelaide	1889
Gardner, Wm, M.D., C.M. ...	Adelaide	1882
Gill, H. P.	Adelaide	1883
Gill, Thomas, ...	Adelaide	1885
*Goyder, Geo., jun.	Adelaide	1880
Grasby, W. C	Adelaide	1887
Grundy, E. B.	Adelaide	1882
Harris, C. H.	Adelaide	1883
Harrold, A. L.	Adelaide	1876
Hay, Hon. A, M L.C.	Adelaide	1861
Henry, A., M.D.	Adelaide	1882
*Howchin, W., F.G.S.	Goodwood East ...	1883
Hughes, H. W.	Booyoolie	1883
(F) Kay, R.	Adelaide	1853
Knevett, S.	Adelaide	1878
*Lamb, Prof., M.A., F.R.S. ...	England	1883
Laughton, E.	Adelaide	1874
Lendon, A. A., M.D.	Adelaide	1884
Lloyd, J. S.	Adelaide	1856
Lower, O. B.	Parkside	1888
*Lucas, R. B.	Adelaide	1885
Magarey, A. T.	North Adelaide ...	1873
*Magarey, Hon. S. J., M.B. ...	Adelaide	1874
Mayo, Geo., F.R.C.S.	Adelaide	1853
Mayo, G. G.	Adelaide	1874
Mestayer, R. L., F.R.M.S. ...	Sydney	1883
*Meyrick, E. T., B.A.	England	1881
Middleton, W. J. E.	Upper Sturt	1882
Mitchell, J. T., M.D.	Port Adelaide... ...	1885
Molineux, A.	Kent Town	1880
(L) Murray, Hon. David, M.L.C. ...	Adelaide	1859
Munton, H. S....	Adelaide	1884
*Parker, Thos.	... ...	1883
Phillips, W. H.	Adelaide	1883
Phillipson, W. T.	Adelaide	1887
Poole, W. B.	Adelaide	1886
Robertson, R., F.F.P.S.	Adelaide	1882
*Rennie, Prof. E. H., D.Sc., F.C.S. ...	Adelaide	1885
Renner, F. E., M.D.	Carrieton	1885
Robins, A. F.	Adelaide	1887
Russell, William	Port Adelaide... ...	1879

*Rutt, Walter, C.E.	Adelaide	1866
Salom, Hon. M., M.L.C.	Adelaide	1866
*Schomburgk, R., Ph.D.	Adelaide	1865
Scott, Jas. L.	Hyde Park	1865
Smeaton, Thos. D.	Mount Barker... ...	1857
Smith, R Barr	Adelaide	1871
Smythe, J. T., B.A., B.E.... ...	Glenelg	1882
*Stirling, E. C., M.D., F.R.C.S. ...	Adelaide	1884
Stuckey, J. J, M.A.	Adelaide	1878
*Tate, Prof R., F.G.S, F.L.S. ...	Adelaide	1876
Thomas, J. D., M.D, F.R.C.S. ...	Adelaide	1877
*Tepper, J. G. O., F.L.S.	Norwoood	1878
*Todd, Charles, C.M.G., M.A., F.R.S.	Adelaide	1856
Tyas, J. W.	Adelaide	1882
Umbehaun, C....	Adelaide	1879
Vardon, Joseph	Adelaide	1889
Varley, A. K.	Mount Gambier ...	1883
*Verco, J. C., M.D., F.R.C.S. ...	Adelaide	1878
Vickery, G.	Meadows	1868
Wainwright, Ed. H., B.Sc. ...	St. Peters	1883
Ware, W. L.	Adelaide	1878
Way, E. W., M.B.	Adelaide	1879
Way, S. J., Chief Justice	Adelaide	1859
Wheeler, F.	Freemantle, W. A. ...	1884
*Whittell, H., M.D., F.R.M.S. ...	Adelaide	1882
Wilson, John, F.E.T.S.	Goodwood	1887
*Wragge, C. L., F.R.G S.	Brisbane	1887
*Zietz, A.	Adelaide	1886

ASSOCIATES.

Hodgson, Mrs....	Port Victor	1884

APPENDIX.

FIELD NATURALISTS' SECTION

OF THE

Royal Society of South Australia.

SIXTH ANNUAL REPORT OF THE COMMITTEE, BEING FOR THE YEAR ENDING SEPTEMBER 30TH, 1889.

The Committee have pleasure in presenting the following abstract of the work of the Section for the past year :—

Excursions.—During the year eleven excursions have been held, at most of which the attendance has been very satisfactory. Some fresh localities have been visited, but no excursion occupying more than one day has been made, as was the case in the previous year. As a change from visits to the hills, which are mostly devoted to the study of botany, there have been a trawling trip, an excursion to the beach at Marino for the collection of shells, &c., and a visit to the Dry Creek Smelting Works.

Evening Meetings.—There have been seven evening meetings during the year. The attendance at these has varied considerably, but on the whole shows an improvement on that of last year. The papers have embraced a wide range of subjects, and have been contributed by the following gentlemen, viz., Professor Tate, F.G.S., Messrs. J. G. O. Tepper, F.L.S., W. B. Poole, D. D. Rosewarne, J. J. East, M. S. Clark, and W. Howchin, F.G.S. The exhibits at these meetings form an important feature, and it is pleasing to notice that they are increasing in number and in interest.

Show of Native Plants, &c.—This was held in the Town Hall in October of last year, and for a first attempt was a considerable

success. It may be stated that this was not intended (as some may have thought) to be chiefly a show of living wild flowers, there being obvious objections to such an exhibition. The principal feature of the show was the Herbaria, while a fine collection of Algæ and of floral paintings added to its variety and attractiveness. In conjunction with this exhibition the Boys' Field Club had a very creditable display of a similar character.

Protection of our Native Fauna and Flora.—The Standing Committee appointed for this purpose have devoted much time and attention to the subject. From a special report of the Committee which will be presented particulars will be gathered as to the progress made in this direction.

Local Correspondents.—Steps have been taken with a view to secure the assistance of correspondents in various parts of the colony, who, it is thought, will in many ways be of service to the Section. It is hoped that these persons will take an interest in the Natural History of the neighbourhood in which they reside, and that their aid will be secured in the preservation of native plants and animals, as well as in furnishing information as to poisonous plants, introduced weeds, native fodder plants, &c.

"*Proceedings.*"—Arrangements have been made whereby the "Proceedings" of the Section for the current year will be printed more fully than before, besides being issued at a moderate cost and at a much earlier date than usual.

Membership.—Eighteen new members have been added to the roll during the year, and twenty names have been removed. Of the latter, seven have left the colony and seven have resigned, the balance being struck off for various reasons. The number now on the roll is 112.

WALTER HOWCHIN, Chairman.
W. H. SELWAY, JUN., Hon. Sec.

Adelaide, 17th September, 1889.

ANNUAL PROGRESS REPORT

Presented by the Native Fauna and Flora Protection Committee at the meeting of the Field Naturalists' Section of the Royal Society held on September 17, 1889.

The Committee appointed at the last annual meeting of the Section to endeavour to secure better protection for the native fauna and flora, desire to present the following progress report :—

National Parks.—As the result of a deputation which waited

on the Premier of the day in October, 1888, together with considerable subsequent correspondence and other action, a promise has been obtained from the Government to the effect that reserves of this character will be made, although the size and other details have not yet been settled.

The Game Laws.—Through the aid of Mr. R. G. Solomon, of Newark, United States, and of local skin merchants, the Government was induced to introduce an amending Game Bill, providing for the partial protection of kangaroos and opossums. The measure, however, met with strong opposition in the Legislative Council, and was rejected by that House on the second reading, without a division being taken. The arguments used by the adverse speakers were apparently based upon the state of affairs existing three years ago and not upon the facts as they now are. The only hope of the absolute extinction of the kangaroo being prevented seems to lie in the fact that before long its numbers will have become so small as to render its chase for the purposes of commerce unremunerative. The Bill was by no means of the comprehensive character desired by the Section, but no further legislation in this direction can be attempted till next session. In accordance with the request of the Committee, placards notifying the chief provisions of the Game Act have been circulated throughout the districts affected by its enactments by order of the Commissioner of Crown Lands, who has given instructions to the police to secure, as far as possible, the observance of the statute. The corresponding members of the Section have also promised to help in this work.

Education in Natural History.—The Committee requested the Education Depertment to give more direct instruction in natural science, especially in its relations to the native fauna and flora, and although not much has yet been done towards this end, there is reason to believe that the next few years will see a considerable advance in the direction indicated. The extension of the operations of the Boys' Field Club to the country towns of the colony will also largely tend to promote that healthier public sentiment which is so desirable in the interests of the movement.

Forest Reserves.—Determined efforts have been made during the year by a certain section of the community to obtain the extensive resumption of forest and other reserves for the purposes of cultivation. The Committee had a motion tabled at a meeting of the Section protesting against any such action being taken, and the resolution was forwarded to the Commissioner of Crown Lands. It is with much pleasure that the Committee have noticed that a motion was subsequently passed in the Upper House affirming the undesirableness of resuming the forest reserves.

Information as to the best methods of securing the objects of the Committee is now being sought by the Committee from similar organizations in various parts of the world, and every feasible means will be used to attain the desired end. The movement has received the approval of the Royal Society and the support of the Geographical Society, the Microscopical Section, and of many other organizations. The subject will be discussed at the next meetings of the Australasian Association for the Advancement of Science, and vigorous efforts have been made by the Committee to excite a healthy interest in the matter in the different colonies.

In conclusion the Committee, although regretting that they can show but few distinctly tangible results, yet hope that the movement will eventually prove in a considerable measure successful, and they trust that they will have the cordial assistance of all with any love for the plants and animals of their country.

Samuel Dixon, Chairman.
A. F. Robin, Hon. Sec.

September 17, 1889.

Receipts and Expenditure for the Year ending 30th September, 1889.

Dr. Receipts.	£	s.	d.	Expenditure. Cr.	£	s.	d.
To Balance brought forward	2	12	6				
" Grant from Royal Society	25	0	0	By Printing	9	5	6
" Amount received from Subscriptions	23	0	0	" Postages	7	18	0
				" Advertising	3	0	8
				" Attendance (caretaker)	1	5	0
				" Bugle	1	15	0
				" Sundries	1	3	2
					£24	7	4
				" Subscriptions handed over to Hon. Sec. Royal Society	23	0	0
					£47	7	4
				" Balance in hand	3	5	2
	£50	12	6		£50	12	6

Audited and found correct,
J. H. C. LANGDON, } Auditors.
THOS. EVANS, }
Adelaide, 16th September, 1889.

W. H. SELWAY, Jun., Hon. Sec.

MICROSCOPICAL SECTION

OF THE

Royal Society of South Australia.

ANNUAL REPORT FOR 1888-9.

We are glad to be able to report that during the year increasing interest has been manifested in the work of the Section. The attendance at the meetings has been much better than in the past, and the members who were present appear to have profited by the various subjects brought under discussion. The plan adopted this session of devoting a short time of each evening to practical demonstration on some elementary branch of microscopical manipulation seems to have had a beneficial effect, and it is to be hoped that, if possible, this plan will be continued.

The excursions made in search of objects have been a source of great pleasure, and many places near Adelaide have been found which afford a valuable field for microscopical research, being rich in organisms—some no doubt new to science.

The Section has been fortunate during the year in receiving two large donations of books. Mr. C. C. Farr, on leaving for England, presented us with a large number of microscopical magazines; and Mr. H. C. Mais has again shown his interest in us by making us a further donation of all his large collection of bound works on the microscope, in all twenty-nine volumes. We have now, for a young Society, a very complete and valuable reference library.

The present number of members is thirty-three. Several have resigned during the year, and six new members have been elected. The average attendance at the meetings has been eleven, exclusive of visitors.

The subjects discussed at the meetings were as follows:—

1888.

Oct. 9. Pollen in its relation to hay fever, by F. S. Crawford.
Nov. 13. Forms of Life found by Dredging, by Mr. Baker.

1889.

Mar. 12 Cleaning lenses, slips, and cover-glasses, by Mr. F. S. Crawford. Structure of the Floscularia, by Mr. Poole.

Apr. 9. Demonstration on cell-making, by Mr. Poole. Paper on a Hydroid Zoophyte, Cordylophora lacustris, by Mr. Baker.

May 14. Paper on Illumination by Condensers, by Dr. Whittell

June 11. Demonstration on mounting wool and fur, by Mr. Poole. Illumination by the Abbe-Condenser, by Dr. Whittell.

July 9. Paper on Pond life, by Mr. J. W. Bussell.

Aug. 13. South Australian Polyzoa, by Mr. Zietz.

Sept. 3. Demonstration on use of Camera-lucida, by Mr. F. S. Crawford.

Excursions have been made to the following places :—

April 6. Hope Valley Reservoir.

May 1. Botanic Gardens.

July 6. Blackwood.

Aug. 10. North Arm.

Signed, F. S. Crawford, Chairman.
J. W. Bussell, Hon. Secretary.

MICROSCOPICAL SECTION OF ROYAL SOCIETY OF SOUTH AUSTRALIA.

Receipts and Expenditure for the Year ending 30th September, 1889.

Receipts.	£	s.	d.
To Balance in hand 30th September, 1888 ..	6	14	0
" Members' Subscriptions	7	5	0
" Grant from Royal Society	7	5	0
	£21	4	0

Expenditure.	£	s.	d.
By Binding Magazines	0	7	6
" Printing and Stationery	0	13	6
" Magazines	1	18	3
" Rail-carriage on Books	0	12	0
" Postages, &c.	0	17	4
" Attendant	1	7	0
" Subscriptions paid Royal Society	7	5	0
Cash in hand	8	3	5
	£21	4	0

Examined and found correct.

EDGAR J. BRADLEY, Auditor.

J. W. BUSSELL, Hon. Secretary.

Vardon & Pritchard, Printers, Adelaide

TRANSACTIONS AND PROCEEDINGS

AND

REPORT

OF THE

ROYAL SOCIETY of SOUTH AUSTRALIA.

VOL. XIII.

For 1889-90.

EDITED BY PROFESSOR RALPH TATE.

[With Plates.]

Adelaide:

W. C. RIGBY, 74, KING WILLIAM STREET.

DECEMBER, 1890.

Parcels for transmission to the Royal Society of South Australia, from Europe and America should be addressed "per W. C. Rigby, care Messrs. Thos. Meadows & Co., 35, Milk Street, Cheapside, London."

Royal Society of South Australia.

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HER MAJESTY THE QUEEN.

Vice-Patron:

HIS EXCELLENCY THE EARL OF KINTORE, K.C.M.G , &c.

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[Elected October 7, 1890.]

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H. T. WHITTELL, M.D.

CONTENTS.

PART I. (Issued June, 1890). PAGE.

MacGillivray, P. H.: An Additional List of South Australian Polyzoa (plate i.) 1

Zietz, A.: A List of South Australian Whales and Dolphins... ... 8

Etheridge, R.: On Some Australian Species of the Family Archæocyathineæ (plates ii., iii.) 10

Meyrick, E.: Descriptions of Australian Lepidoptera, Part I. ... 23

Blackburn, Rev. T.: Further Notes on Australian Coleoptera, VII. 82

Mueller, Baron, and Tate, Prof.: List of Plants collected during Mr. Tietkins' Expedition into Central Australia 94

Kirk, T. W.: On the Soaring of the Hawk 110

Tate, Prof. R.: On the Geological and Botanical Features of Southern Yorke-Peninsula 112

PART II. (Issued December, 1890).

Blackburn, Rev. T.: Further Notes on Australian Coleoptera, VIII. 121

Howchin, W.: Estuarine Foraminifera of the Port Adelaide-River ... 161

Mueller, Baron: Supplement to List of Central Australian Plants . 170

Tate, Prof. R.: On the Discovery of an Older Pliocene Formation in South Australia 172

Tate, Prof, R.: On the Stratigraphical Relations of the Tertiary Formations about Adelaide 180

Tate, Prof. R.: The Gastropods of the Older Tertiary of Australia, Part III. 185

MISCELLANEOUS CONTRIBUTIONS.

Parasite of Stick-Case Moth 236

Protracted Pupation of *Antheræa Helenæ*... 236

Diprotodon-Remains 236

Foraminifera of the Muddy Creek-beds 236

Poisonous Properties of *Euphorbia eremophila* 236

Fluorescence of *Bursaria spinosa* 237

BIBLIOGRAPHY.

Rectification of the Nomenclature of *Hectoria Pontoni* 238
Additional Species of Australian Fungi 238
Additional Species of South Australian Flowering Plants 242
Additions to the Insect-Fauna of South Australia 243
Older Tertiary Gastropods of Australia 243

Abstract of Proceedings 245
Annual Report 252
Balance Sheet 256
Presidential Address 257
Donations to the Library 269
List of Fellows, Members, &c. 276

APPENDICES.

Report of the Field Naturalists' Section 279
Report of the Microscopical Section 284

Index 287

An Additional List of South Australian Polyzoa.

By P. H. MacGillivray, M.A., M.R.C.S., F.L.S., Corr. Memb.

[Read November 5, 1889.]

Plate I.

Mr. Thomas D. Smeaton has recently sent to me for examination a large number of specimens of South Australian Polyzoa. The total number of species in the collection is 119, and of these 71 do not occur in the list recently contributed to the Society. They are mostly well-known Victorian forms, but several are of rare occurrence, and three have not previously been described.

The following is a list, with localities, of those not previously noticed :—

CLASS POLYZOA.

Order Gymnolæmata, *Allman.*

(infundibulata, *Gervais*).

Suborder Cheilostomata.

FAMILY AETEIDÆ.

Aetea, *Lamx.*

A. dilatata, Busk. Robe.

FAMILY EUCRATEIDÆ.

Dimetopia, *Busk.*

D. spicata, Busk. Robe.

FAMILY CHLIDONIIDÆ.

Chlidonia, *Savigny.*

C. Cordieri, Aud., sp. Kangaroo Island.

FAMILY CATENICELLIDÆ.

Catenicella, *Blainville.*

C. alata, Wyv. Thomson.
C. plagiostoma, Busk. Port Elliott.
C. formosa, Busk. Port Elliott.
C. gracilenta, McG. Robe.
C. carinata, Busk. Kangaroo Island.
C. delicatula, J. B. Wilson, sp.

CLAVIPORELLA, *McG.*

C. geminata, Wyv. Thomson, sp. Glenelg.
C. aurita, Busk, sp. Robe.

FAMILY CELLULARIIDÆ.

DIDYMIA, *Busk.*

D. simplex, Busk.

SCRUPOCELLARIA, *Van Beneden.*

S. cyclostoma, Busk.
S. ornithorhynchus, Wyv. Thomson. An imperfect fragment.

CANDA, *Lamx.*

C. arachnoides, Lamx. Brighton.

CABEREA, *Lamx.*

C. Darwinii, Busk. Encounter Bay ; Robe.
C. rudis, Busk. Robe.
C. grandis, Hincks. The specimens are mostly very rigidly calcified.

MENIPEA, *Lamx.*

M. cyathus, Wyv. Thomson. Robe.
M. tricellata, Busk, sp. Robe.

FAMILY SALICORNARIIDÆ.

CELLARIA, *Lamx.*

C. hirsuta, McG. Encounter Bay.

FAMILY BICELLARIIDÆ,

BICELLARIA, *Blainville.*

B. tuba, Busk. Encounter Bay,
B. gracilis, Busk. Robe.

FAMILY FLUSTRIDÆ.

CARBASEA, *Gray.*

C. dissimilis, Busk.

FAMILY MEMBRANIPORIDÆ.

PYRIPORA, *D'Orbigny.*

P. polita, Hincks, sp. Kangaroo Island.

ELECTRA, *Lamx.*

E. multispinata, Hincks, sp.
(Membranipora pilosa, *var.* multispinata, *Hincks.*)

BATHYPORA, *McG.*

B. (Membranipora) nitens, Hincks.

MEMBRANIPORA, *Blainville.*

M. membranacea, Linn. sp. Brighton, Robe.

M. prælonga, n. sp. Fig. 1. Zoarium encrusting. Zoœcia opposite in regular longitudinal and transverse series, very large, much longer than broad, separated by narrow raised lines; upper extremity arched and thickened ; no spines or processes.

This is an exceedingly delicate species, spreading as a thin film over the surface of a broad leaf of, seemingly, Zostera. The zoœcia are very regular in transverse and longitudinal rows, the separating walls being very slender. There are no spines or processes as in its nearest congener *M. membranacea*. A curious circumstance is that many of the longitudinal rows consist entirely of aborted zoœcia, which are of the same length as the others, but are narrower, destitute of mouth, and have the transverse separating partitions straight and very thin. In many of these there is a white shining fibrous bundle, the nature of which is not apparent ; it may be parasitic.

Mr. Smeaton informs me that this was found at Wallaroo by Mr. O'Halloran.

M. corbula, Hincks. Robe.

AMPHIBLESTRUM, *Gray.*

A. argenteum, McG. (Lepralia trifolium, *McG.*)

A. cervicorne, Busk.

BIFLUSTRA, *D'Orbigny.*

B. jugalis, n. sp. Figs. 2 and 2*a*. Zoarium crustaceous. Zoœcia alternate, in regular lines, elongated, quadrate ; margins thick, granular ; upper margin thick, with a short blunt process at each end ; anterior surface for a large extent strengthened by a very thin, slightly granular, calcareous layer.

Of this there is only a single small specimen. The anterior thickening of the surface is very indistinct, and I am not satisfied that it should not rather be referred to *Membranipora*.

FAMILY MICROPORIDÆ.

THAIROPORA, *McG.*

T. dispar, McG. Brighton.

DIPLOPORELLA, *McG.*

D. cincta, Hutton, sp. Brighton.

MICROPORA, *Hincks.*

M. coriacea, Esper., sp. Glenelg.

M. perforata, McG. Robe.

FAMILY STEGANOPORELLIDÆ.

STEGANOPORELLA, *Smitt.*

S. magnilabris, Busk, sp. Aldinga.

FAMILY CRIBRILINIDÆ.

HIANTOPORA, *McG.*

H. ferox, McG.

FAMILY MICROPORELLIDÆ.

MICROPORELLA, *Gray.*

M. ciliata, Linn., sp.
M. Malusii, Audouin, sp.
M. diadema, McG. Robe.
" var. *longispina*, McG. Semaphore.

ADEONA, *Lamx.*

A. albida, Kirchenpauer, var. *avicularis*, McG.

FAMILY ESCHARIDÆ.

SCHIZOPORELLA, *Hincks.*

S. Maplestonei, McG. Figs. 4, 5, and 5*a*. Of this two marked forms occur, which might almost be considered as distinct species. In the typical form the zoœcia are rhomboidal, separated by narrow raised margins, the surface shining and perforated. The mouth is arched above, wider than high. The lower lip straight, with a small rounded sinus. The peristome above is slightly thickened. On each side in front, below the mouth, is a small, solid, rounded protuberance, occasionally wanting. The oœcium is broad, prominent and flattened in front, the upper margin forming a thickened and smooth band, a more or less regular row of white-bordered pores along the inner margin of the band, and others scattered over the anterior surface. The peristome of the oœcial cells is produced as a flat pointed process from each side to meet in the centre, forming an arch over the suboral sinus. The front of the oœcium in perfect specimens is usually of a bright-brown colour, forming a marked contrast to the white rim. In others, however, the bright colour is lost.

I have no doubt this is identical with *S. lucida*, Hincks (Ann. and Mag. Nat. Hist., March, 1885).

The other form, which may be named var. *avicularis*, has an elliptical avicularium placed obliquely below or to one side of the oral sinus ; below or supporting the avicularium there is usually a small, irregular, glassy, calcareous mass, extending partly down the centre of the cell, and frequently with one or more shining nodules comparable to the two suboral processes in the normal form. The peristome in the barren cells is usually produced on

one side. The oœcia are more prominent superiorly, the peristomial arch thicker and stronger, and the surface occasionally traversed by distinct lines. Some oœcia are coloured a bluish purple, with the margin and peristome a dead-white.

S. dædala, McG. Robe.

S. hyalina, Linn. sp., var. *tuberculata*. Robe.

S, Ridleyi, McG.

S. Smeatoni, n. sp. Figs. 3 and 3*a*. Zoarium bilaminate. Zoœcia in longitudinal lines, separated by furrows, at the bottom of which is a narrow raised line, elongated, raised in the centre, with numerous small perforations; mouth arched above, lower lip with a wide sinus and a minute denticle on each side. Operculum with a narrow membranous fringe. Oœcia large, granular, traversed by depressed lines, orifice wide, the lower lip with a broad shallow sinus.

The zoœcia at the edge of the zoarium are much elongated, farther back becoming shorter. They are arranged more or less in lines, separated by furrows. The surface is covered with small perforations, frequently arranged in a line towards each margin and one down the centre. They are raised in the middle, and below the mouth there is usually a smooth nodule or umbo. The sinus in the lower lip is wide, tolerably deep, with the angle rounded. On the oœcia there is generally a short, depressed line extending vertically upwards and bifurcating so as to divide the surface into three elevated portions. On the older parts of the zoarium the separating furrows are nearly obliterated.

HIPPOTHOA, *Lamx.*

H. divaricata, Busk.

PETRALIA, *McG.*

P. undata, McG.

PORELLA, *Gray.*

P. papillifera, McG.

P. marsupium, McG.

PORINA, *D'Orbigny.*

P. larvalis, McG. Semaphore.

MUCRONELLA, *Hincks.*

M. vultur, Hincks.

M. tricuspis, Hincks.

M. diaphana, McG. Brighton.

M. excavata, McG. This species is identical with *M. præstans*, described by Hincks from New Zealand. The specimen figured in the Zoology of Victoria had no avicularia, which, in fact, are frequently absent.

RHYNCHOPORA, *Hincks.*

R. bispinosa, Johnston, sp. Semaphore.

FAMILY CELLEPORIDÆ.

CELLEPORA, *Fabricius.*

C. bispinata, Busk.
C. tridenticulata, Busk.
C. prolifera, McG.

SCHISMOPORA, *McG.*

S. signata, Busk, sp.
S. munita, McG., sp.

FAMILY RETEPORIDÆ.

RETEPORA, *Imperato.*

R. porcellana, McG.
R. monilifera, McG.
form, *munita*, McG.
form, *umbonata*, McG.
R. granulata, McG.

SUBORDER CYCLOSTOMATA.

FAMILY IDMONEIDÆ.

HORNERA, *Lamx.*

H. foliacea, McG.

FAMILY TUBULIPORIDÆ.

ENTALOPHORA, *Lamx.*

E. australis, Busk, sp. Encounter Bay.

FAMILY DISCOPORELLIDÆ.

LICHENOPORA, *Defrance.*

L. echinata, McG.
L. reticulata, McG. Brighton.

SUBORDER CTENOSTOMATA.

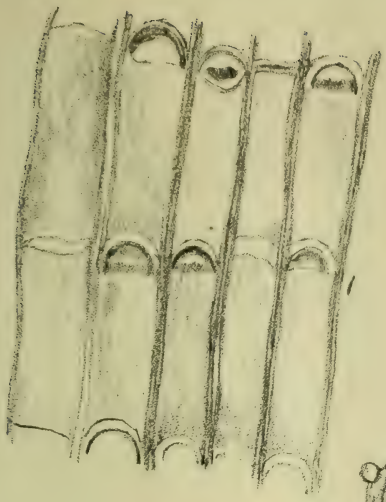
FAMILY VESICULARIIDÆ.

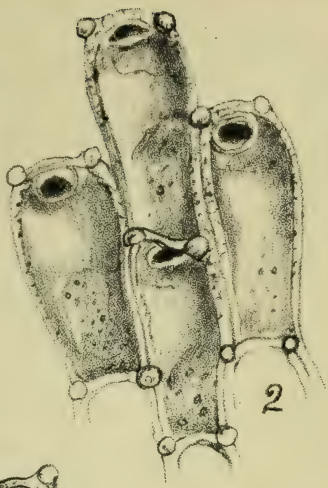
AMATHIA, *Lamx.*

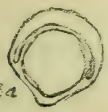
A. bicornis, Tenison-Woods. Robe.

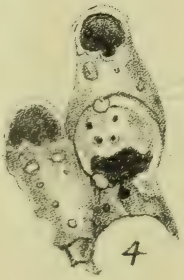
The following are additional localities for species mentioned in previous paper :—

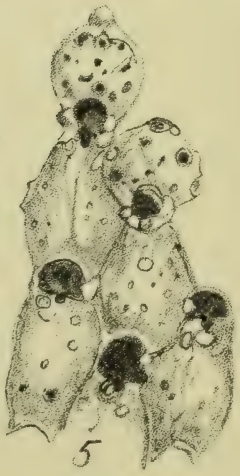
Catenicella ventricosa, Busk. Robe.
C. crystallina, Wyo. Thoms. Port Elliott.











Calpidium ponderosum, Goldst., sp. Aldinga.
Cellularia cuspidata, Busk. Encounter Bay.
Scrupocellaria scrupea, Busk. Encounter Bay.
Menipea crystallina, Busk, sp. Robe.
Bugula cucullata, Busk. Lacepede Bay.
B. dentata, Lamx. Robe.
B. neritina, Linn., sp. Brighton.
Carbasea pisciformis, Busk. Kangaroo Island.
Flustra denticulata, Busk. Encounter Bay.
Electra flagellum, McG. Brighton.
Thairopora Woodsii, McG. Semaphore.
T. Jervoisii, Hincks, sp. Brighton.
Cribrilina monoceros, Busk. Brighton.
Schizoporella schizostoma, McG. Brighton.
Mucronella Ellerii, McG. Glenelg.
Smittia trispinosa, Johnston, sp. Brighton ; Semaphore.

EXPLANATION OF PLATE I.

Fig. 1. *Membranipora prælonga*, × 20.

Fig. 2. *Biflustra jugalis*, group of zoœcia × 45. Fig. 2*a*. Single zoœcium, showing the oral flap, × 45.

Fig. 3. *Schizoporella Smeatoni*, × 45, showing zoœcia and oœcium. Fig. 3*a*. Operculum, × 100.

Fig. 4. *Schizoporella Maplestoni*, normal form, × 45.

Fig. 5. *Id*, var. *avicularis*, showing suboral avicularium and thickening of peristome in ordinary zoœcia. Fig. 5*a*. Another zoœcium and oœcium from the same specimen. All × 45.

A List of the Whales and Dolphins of the South Australian Coast in the Public Museum, Adelaide.

By A. Zietz, Assistant Museum-Director.

[Read December 3rd, 1889.]

FAMILY BALÆNIDÆ (Whalebone Whales).

1. Neobalæna marginata, *Gray*. Pigmy Whale.

Of this species three individuals in the flesh have been received at the Museum, two from Kangaroo Island, and one very young animal from Encounter Bay; besides which there is an ear-bone from the former locality. The species was first found on the New Zealand coast, and was described in 1870 from some plates of baleen in the British Museum and from the skull and baleen of a small individual, 16 feet long, that was cast ashore on the Island of Kawau;* it was considered by Dr. Gray to represent in the Southern Seas the Great Right Whale of the Arctic Ocean. At a later period, it was found on the coast of Western Australia; and quite recently in our own waters.

The external characters of this whale were unknown till the receipt of the specimens at the Adelaide Museum; two of which have been photographed and exact measurements taken from the fresh animals; thus adding valuable information to our knowledge of this species.

The species-name is in reference to the outer blackish margin on the baleen.

2. Megaptera boops, *Linn.* Rorqual.

To this species probably belongs the whale which was stranded at Corny Point, the skeleton of which is displayed in the Whale-Shed, annexed to the Museum, as Mr. G. Beazley, our taxidermist, informs me that the underside of this specimen was very strongly folded in a longitudinal direction, commencing from the anterior point of the lower jaw.

According to Professor W. H. Flower it is uncertain whether all the following specimens, referred to in his Catalogue (British Mus., 1885), belong to one or several species. If to more than one their distinctive characters have not been defined. The British Museum possesses examples from Greenland, California, and New Zealand.

* Hector, New Zealand Cetaceans; Phil. Soc., Wellington, 1872.

FAMILY PHYSETERIDÆ (Cachalots).

3. PHYSETER MACROCEPHALUS, *Linn.* Cachalot or Sperm Whale.

The Museum possesses a skeleton, measuring 53 feet in length, obtained from an individual which was stranded at Point Bolingbroke, Port Lincoln, November, 1881. This species is widely distributed.

4. KOGIA BREVICEPS, *Blainville.* Short-headed Cachalot.

A lower jaw of this very small species was recently obtained by Mr. Adcock at Middleton, Encounter Bay, and by him presented to the Museum. The dental formula is $\frac{0}{1\,3}\ \frac{0}{1\,3}$; the teeth being only in the lower jaw, as in the other cachalots; the last tooth on each side has its point directed backwards, and in its whole length nearly rests on the ridge of the jaw—a peculiarity which I find not mentioned in any description of the species. The lower jaw is slight and fragile, and has scarcely any condyles; the broad ramus is nearly as thin as paper, with the sides much inflexed.

This species is recorded from New South Wales and Madras; and now for the first time from South Australia.

FAMILY DELPHINIDÆ (Dolphins).

5. GRAMPUS GRISEUS. Grampus.

A skeleton of a grampus, eleven feet long, was found on the beach between Glenelg and Brighton, the skull of which is in the Museum. It probably belongs to the above-named species, the only one in the genus which is recorded from the North Sea to Cape Town.

6. DELPHINUS DELPHIS, *Linn.* The Common Dolphin.

This species is figured by Dr. Gray, "Zoology of the Voyage of the Erebus and Terror," under the name of *D. Forsteri;* but Professor Flower, in the Brit. Mus. Cat., refers it to the Linnean species, which, according to him, has a very wide range, embracing the shores of the North Atlantic, South Africa, Tasmania, New Zealand, South Seas, and Antarctic Seas. It is common on our coast.

7. STENO ROSTRATUS.

This species, as in the case of the Common Dolphin, is incorrectly called a *porpoise.* It is easily distinguished from the porpoise by having a much larger and thicker head, and the snout more tapering, and not so abruptly narrowed; the tail and breast-fins are also much broader, and the body narrowed behind. It is not so neatly shaped as *Delphinus delphis,* and the teeth are much stronger and less numerous.

The Brit. Mus. Cat. records it from Cape Seas, Admiralty Islands, and India. Its presence in the Australian Seas has hitherto not been noted, though it is not uncommon on our coast.

On some Australian Species of the Family Archæocyathinæ.

By R. Etheridge, Jun., Palæontologist to the Australian Museum and Geological Survey of N. S. Wales

Plates II. and III.

[Read December 3rd, 1889.]

Some months ago I received from Prof. Ralph Tate, F.L.S., &c., of Adelaide University, the fossils which form the subject of the present notice. After some trouble they were provisionally determined as *Archæocyathus*, a low form of invertebrate life characteristic of the Cambrian strata of North America, and laid aside pending the appearance of a memoir on this and allied genera by my friend George Jennings Hinde, Ph.D., which I casually heard was in preparation. This having now appeared,* the subject may be well resumed.

Dr. Hinde's excellent paper renders it quite unnecessary for me to retraverse old ground, but simply recommending it to those interested in these remarkable genera as an admirable solution of a difficult and obscure subject, I may at once proceed to compare the Australian fossils with the various genera comprising the Family *Archæocyathinæ*.

First, however, it is requisite to fix the localities of the Australian fossils. They are from Ardrossan, Yorke's Peninsula; the Wirrialpa and Blinman Mines, near the Blinman, a mining township on Eurilkina Creek, Flinders Range; and Kanyka, north-east of Port Augusta.

The only geological information I am in possession of relates to the first of these localities. The Ardrossan rocks appear to have been first described by Mr. Otto Tepper, and we are also indebted to him for the first discovery of its fossils. In his paper, "Introduction to the Cliffs and Rocks at Ardrossan"† he describes the Palæozoic rocks as consisting of the Ardrossan sandstone overlain unconformably by Tertiary rocks, and conformably below it a variegated and dark-coloured limestone and white and yellow marbles, called the Parara limestone. He remarks—"Both varieties of the upper marbles contain distinct

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* On *Archæocyathus*, Billings, and on other Genera allied to or associated with it from the Cambrian Strata of North America, &c.—Quart. Journ. Geol. Soc., 1889, XIV., p. 125.

† Trans. and Proc. Phil. Soc., Adelaide, for 1878-79 (1879), p. 70.

fossils and abundantly minute fragments of such, but the upper one by far the most, conspicuous amongst which occasionally a trilobite; and coral structure appears to perfection in sea-rolled pebbles, the fossil shows in beautiful contrast of colour upon the smooth surface. Prof. Tate holds the tentative opinion that the fossils are of the Lower Silurian age of Murchison." At p. 48 of the same volume Prof. Tate states that "the fossils consist chiefly of heads and other fragments of a species of blind trilobite, probably an *Olenus*, a small species of *Euculiomphalus*, a *Capulus*, a *Creseis?*, and fragments of corals (some of which show a cystiphylloid structure)." Below these beds Mr. Tepper describes unconformable to them the "Ardrossan Marbles," a yellowish or pink-coloured, but not variegated, saccharoid limestone of Pre-Silurian age. The age and relation of these fossiliferous limestones to foreign equivalents will be discussed later.

The Family Archæocyathinæ of Bornemann consists of the Genera *Archæocyathus*, Billings, *Ethmophyllum*, Meek, *Coscinocyathus*, Bornemann, *Anthomorpha*, Bornemann, *Protopharetra*, Bornemann, and *Spirocyathus*, Hinde, according to the last-named author.

If certain determinations of the late Prof. L. G. de Koninck are to be relied on the family is already known in the Devonian (?) rocks of New South Wales. In 1876 he describes some ill-preserved fossils from the Yass district, provisionally called *Archæocyathus (?) Clarkei*.* They formed a portion of the late Rev. W. B. Clarke's collection in the Mining and Geological Museum, and were destroyed with the general body of that series in the Garden Palace fire, and I regret to say we are not again in possession of a specimen of this fossil. Its true affinities must for the present, therefore, remain doubtful, for we find Dr. Hinde remarking—"Judging from the description and figures, no definite opinion can be formed as to their real character." According to DeKoninck *A. (?) Clarkei* consists of irregularly-plicated bodies of considerable extent, both laterally and longitudinally, enclosing deep cavities of very variable form. The tissue forming the walls is from eight to ten millimetres in thickness, the external walls being furnished with irregular protuberances, and pierced by small openings. The tissue between the walls is irregularly spongy, and retiform in structure.

So far as I am aware this is the only reference to the occurrence of a supposed *Archæocyathus*, or one of its allies, in Australia, but quite recently Prof. W. J. Stephens, M.A., has obligingly lent me two specimens from the neighbourhood of Yass, which may turn out to be of this nature. I may, however, state

* Foss. Pal. Nouv. Galles du Sud, 1876, pt. 2, p. 68, t. 2, f. 1.

that about five years ago, when examining the matrix of the Trilobites from Ardrossan, with Dr. Henry Woodward, we noticed fragments of an obscure fossil, believed to be those of a coral, and evidently those referred to by Mr. Tepper, which greatly puzzled us. They were described by Dr. Woodward in the following words.* The calices "are about twelve millimetres in diameter. The septa are numerous, and very short, with a thickened spongy columella; the corallites are irregular, and few in number, and appear to be united by a cellular cœnenchyma." The fragments referred to in this quotation I now know to be the same as those at present under description.

The genus *Archæocyathus*, briefly stated, consists of free cup-shaped or turbinate forms, with a tubular central cavity. "The wall of the organism consists of an outer and inner lamina or plate, bounding the exterior and the inner surface of the cup respectively, and a series of stout vertical radial septa, which, like those of a coral, extend from the outer to the inner wall plates. Both walls are perforate, but a delicate imperforate enveloping lamina exists. The septa are also perforate, even in thickness, and in their distance apart, the interseptal loculi being filled with dissepiments. The outer surface of the cup is either smooth, horizontally ridged, or rugose. New septa are introduced by intercalation.

This is the general structure of *Archæocyathus*, without entering into minute details, as emended by Dr. Hinde. The genus *Ethmophyllum* is substantially the same, except that the inter septal locali are not filled with dissepiments, and the inner wall "instead of communicating with the interior of the cup or tube by simple perforations consists of a series of relatively large canals directed obliquely upward and inward, so that in transverse section they present the appearance of one or more rows of vesicles cut across."

Archæocyathus is now known to occur in North America and the island of Sardinia, and is characteristic of Lower Cambrian strata; whilst *Ethmophyllum* has been met with in strata of the same age in the country first named and Spain.

The fossils from South Australia are either enclosed in limestone or are on the weathered surfaces of the latter, with one or two exceptions. They all present, more or less, the same appearance, excepting only the colour of the limestone, which varies from dark bluish-grey to a light grey, or even a rock with a warm reddish tint, as that from Ardrossan. The examples from Kanyka are weathered partially out of the limestone, displaying the general

* Notes on the Remains of Trilobites from South Australia. *Geol. Mag.*, 1884, iii., p. 342.

features of the organisms to advantage. The Wirrialpa specimens, on the contrary, from their similarity to the colour of the limestone are difficult to discern at a first glance, a difficulty which is increased by the large number of fragments present of the broken-up wall.

In the Ardrossan limestone the corals are usually seen in section, and show to advantage from the white colour of their walls and tissue as compared with the colour of the matrix. I have not examined any very complete individuals from this rock, and from its peculiar semi-conchoidal fracture it is not easy to obtain sections along any given well-defined line. A few weathered-out examples have been examined from Kanyka, and these have yielded good results, but in the majority of cases information has been gained chiefly through sections.

Measurements are rendered difficult from the various angles at which the corallums are naturally cut by the fracture or weathering of the matrix. Taking the specimens irrespective of genus, an imperfect corallum from Wirrialpa is one and three-quarter inches long, and another seen in section from Ardrossan measures one and a half inches in its longest diameter, slightly obliquely. An imperfect calyx from the former locality is one and a quarter inches in diameter, but others from the latter are much larger, although some which appear in transverse section in the limestone possess a diameter of half an inch or slightly more, and this is a common measurement. An example from Wirrialpa differs from most of the others in having a markedly oval section, the longest diameter being one inch and the shorter three quarters of an inch. A more perfect fragment from Kanyka, three quarters of an inch in length, has a diameter at one end of half an inch, and at the other measures three-eighths. A well-preserved little corallum in Prof. Tate's collection, three quarters of an inch in length, possesses a diameter of a quarter of an inch, and, judging from the number of the septa is the most rudimentary form I have seen.

From these figures we learn that the South Australian specimens, on the whole, are of less size than the Canadian *Archæocyathus*, although one or two examples are quite as tall as the former, but fall short in the diameter of their calices.* Similarly they are undoubtedly shorter than the type specimen of *Ethmophyllum*, *E. Whitneyi*, Meek,† in which the corallum reaches as much as six or more inches in length, and again shorter than the Spanish species of the last-named genus, *Ethmophyllum marianum*, Roemer‡, but the largest from Ardrossan, and the larger

* Bull. U.S. Geol. Survey, 1886, No. 30, p. 72.

† *Ibid*, t. 4, f. 1.

‡ Lethæa Geognostica, Theil 1, Lethæa Palæozoica, 1 Lief., 1880, p. 301, f. 55*a*.

Wirrialpa specimens would seem to correspond well in diameter with the sectional figures of *Coscinocyathus* given by Dr. Bornemann.

Genus Ethmophyllum.

The specimens referred to this genus are small or of medium size, with a diameter of from a quarter to three quarters of an inch. The general form of our fossils is that of a long, slowly tapering, inverted cone, at times becoming turbinate, or rather cup-shaped, and circular or oval in section, with a large central tubular, or occasionally infundibuliform cavity. When the substance of the corals has weathered more rapidly than the infilling matrix, the latter is left projecting as a plug, giving to them a defined and characteristic appearance. The line of demarcation between this plug and the narrow external ring formed by the septa is a very marked one. In one of Prof. Tate's specimens the conate outline of the calice is clearly indicated by the plug of limestone infilling it. In weathered specimens free of matrix, the outer edges of the septa are usually visible as vertical lamellæ, when the resemblance to an ordinary decorticated Rugose coral is very strong. The outer covering, answering to the epitheca, has not been observed, but certain peculiar appearances here visible will be referred to later. Observation has not shown this to be other than a free form.

The minute anatomy resembles both that of *Archæocyathus* and *Ethmophyllum*, in possessing a well-marked septal area, always apparent in a transverse section (Pl. II., figs. 1-3) defined by an outer and inner lamina, bounding the outside and inside of the funnel-shaped corallum.

The septa in all our specimens are stout, rigid, and well marked lamellæ extending from the top to the bottom of the corallum, possessing, when viewed transversely, a general pillar-like appearance, and increasing by the interpolation of new septa, through the subdivision, or bifurcation of the older. The outer and inner ends of the septa in many instances are seen to expand more or less, where disrupted from the bounding laminæ, and when in this condition are not unlike the pillars of *Receptaculites* (Pl. II., fig. 4).

In *Archæocyathus* dissepiments are profusely developed, dividing the interseptal spaces into loculi, a character which is excellently shown in one of Dr. Hinde's figures. In *Ethmophyllum*, however, this dissepimental tissue is said to be apparently wanting, and the vast majority of the specimens before me agree with *Ethmophyllum* in this peculiarity (Pl. II., figs. 1 and 3). At the same time one section (Pl. II., fig 2) does exhibit simple, straight, transverse bars between the septa more or less in a line, dividing the loculi into rhomboidal spaces. These dissepiments, for such

must be their nature, are more prevalent near the outer margin of the septal area, and in places are much broken up, as if porous. On the whole, however, the general features of transverse sections of the septa are so essentially those of *Ethmophyllum*, as exemplified in Mr. C. D. Walcott's figure of *E. Whitneyi*, Meek,* Dr. Hinde's illustration of the same species,† and Prof. F. von Roemer's representation of the Spanish *E. marianum* ‡ that we must consider that the characters of the South Australian coral to be more in harmony with this genus than *Archæocyathus*.

The septa are very regular in appearance, of uniform width, and equi-distant, presenting in these particulars a strong contrast to the crowded and somewhat irregular condition in *Archæocyathus*. Furthermore they extend completely across the septal area, as figured by Dr. Hinde, Mr. Walcott, and von Roemer, and again, unlike those of *Archæocyathus*, do not stop short of the inner margin, curve round, and unite with one another.

It has proved difficult to ascertain the number of septa, owing to the imperfect condition of the calices, or the awkward angle at which the natural section of the coral has been fractured. A small specimen of Prof. Tate's possesses about twenty thick and widely separated septa (Pl. III., fig. 10), and this is the least number I have observed. Between twenty on the one hand, and forty-five, thirty-five, forty-nine on the other, but in some cases these do not represent the complete cycles, the specimens being imperfect. The septal area has an average width of from three to four millimetres, but is so frequently cut in oblique section that accurate measurements are difficult to obtain.

The structure of the septa and the inner and outer laminæ is usually very compact, dense, and homogenous, and it is seldom that any details can be made out. But in one horizontal section certain peculiar appearances are present, in the form of small, clear, circular spots in the substance of the septa, which can only be explained on the supposition that they are either vertical tubuli or pores passing through the septa obliquely. Another section, taken from a specimen from Wirrialpa, shows decided evidences of a secondary deposit in the form of a lining of clear calcite following the outline of each interseptal loculus, easily distinguished from the denser material of the septa, and with a more or less undulating margin (Pl. II., fig. 1).

The inner and outer lamina, or wall-plates, have exactly the same structure as the septa. The former is, however, much

* Bull. U.S. Geol. Survey, 1886, No. 30, t. 4, f. 1-1*h*.
† Quart. Journ. Geol. Soc., 1889, xlv., t. 5, f. 7.
‡ Lethæa Geognostica, *loc cit*, p. 300, f. 55*b*.

broken up, probably from its perforate nature, as described by Dr. Hinde, both in *Archæocyathus* and *Ethmophyllum*. The inner lamina, on the contrary, entirely departs from the *Archæocyathus*-type, and closely follows that of *Ethmophyllum*. In the former it is delicate, and directly "perforated by closely set circular apertures regularly arranged in quincunx." In the latter, however, this inner lamina "consists of a series of relatively large canals directed obliquely upward and inward, so that in transverse section they present the appearance of one or more rows of vesicles cut across." This is the fundamental difference between the two genera, and is precisely the structure we have presented in the South Australian fossils. In Pl. II., figs. 3 and 4, the septa will be seen to dissolve into a single, or at the utmost a double row of irregular or partially-preserved vesicles. It will, therefore, be apparent that the fossils now under description must be referred to *Ethmophyllum* rather than *Archæocyathus*.

Dr. Hinde describes the outer wall-plate as protected by an epithecal lamina, apparently non-perforate, in *Archæocyathus*; but mention is not made either of its absence or presence in *Ethmophyllum*. I have quite failed to detect any non-perforate epithecal layer, a point in which the present specimens resemble the Sardinian *Archæocyathus* examined by Dr. Hinde; this may be, however, a mere matter of preservation.

With the view of confirming the reference here made to *Ethmophyllum*, a comparison may advantageously be made of the cross section of the inner lamina-tubes of Pl. II., fig. 4, with Mr. Walcott's figure* of the same structure in *E. Whitneyi*; our illustration of dissepiments with his figure† of these divisions in the same species; and lastly, the secondary deposit investing the septa in Pl. II., fig. 1, with their clothed condition in another of the same author's figures‡ of *E. Whitneyi*.

In dealing with fragmentary material such as the present it is very difficult to limit the characters on which specific separation can be based, but it is possible that two species may be differentiated on the size, form, and number of the septa. For instance, the dissimilarity visible in the structure of Pl. III., fig. 10, with its small corallum and few and widely-separated septa, with that presented by Pl. II., figs. 2 and 3, may be specific; but so much variation in the number of the septa has been noted that, for the present, the specimens had better be regarded as forming one species only, under the name of *Ethmophyllum Hindei*.

As here defined *E. Hindei* has been found at Kanyka (Pl. II., fig. 2), the Blinman (Pl. II., fig. 3), and at Wirrialpa (Pl. II., fig. 1).

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* Bull. U. S. Geol. Survey, 1886, No. 30, t. 4, f. 1 *c*.
† *Loc. cit.*, t. 4, f. 1 *h*.
‡ *Loc. cit.*, t. 4, f. 1 *e*.

Genus COSCINOCYATHUS.

Associated with *Ethmophyllum Hindei*, at least one locality, are other fossils, usually more or less fragmentary, which possess, in addition to the structure common to both *Archæocyathus* and *Ethmophyllum*, the distinguishing features of *Coscinocyathus*, Bornemann.* This genus, according to Dr. Hinde, contains "turbinate, open saucer-shaped, or subcylindrical forms, resembling *Archæocyathus* in the character of the outer and inner wall-plates, and of the septa, but possessing in addition transverse cribriform plates, which subdivide the vertical interseptal loculi. These transverse plates, which may be compared to the tabulæ in fossil corals, only that they are perforate, extend quite across the space between the outer and inner laminæ of the wall, but they do not extend into the interior hollow cup. In some cases they are nearly horizontal, in others they are arched, or even oblique."

And here I may remark on the extraordinarily resemblance which exists between the lithological features of the Sardinian rock, with the appearance of its fossils when seen in section, and the Wirrialpa and Ardrossan limestones, so much so as almost to make one boldly assert that the limestones are identical.

The fossils, now referred to *Coscinocyathus*, are of larger size than the preceding, *Ethmophyllum*, with a greatly increased number of septa, usually in the form of portions of the septal area, straight or curved, or more or less irregularly shaped corallums, sometimes oval or oblong, similar to Bornemann's *C. cancellatus*;† or, at other times, semi-meandering masses, but the outline, as now seen, always more or less dependent on the angle at which the limestone is cut or fractured (Pl. III., fig. 1).

In a fragment of a large septal, area (Pl. III., fig. 7) tissue is visible between the septa, in every way answering to Dr. Hinde's description, and Bornemann's figures of *Coscinocyathus dianthus*‡ and *C. anthemis*.§ This specimen, which seems to conclusively prove the presence of this genus, is from Wirrialpa. In another specimen, which from the number of the septa, and their size, would also appear to be part of a *Coscinocyathus*, the outer wall plate (Pl. III., figs. 5 and 6) with its perforations is plainly visible. The pores are arranged in vertical alternating rows, from three to four between every two septa, and give rise to a roughly quincuncial arrangement. It also shows the increase in the number of septa by the interpolation of new ones. In

* Die Verst. Cambrischen Schichtensystems der Insel Sardinien, 1886, p. 59.

† *Loc. cit.*, t. 20, f. 2.

‡ *Ibid*, t. 17, f. 6 and 7.

§ *Ibid*, t. 21, f. 2.

another example from Wirrialpa (Pl. III., fig. 8) consisting of the inner ends of a few septa, there is also visible the inner perforated wall plate precisely similar to the parallel structure of *C. pandora*, Bornemann,* and *C. anthemis ?* Bornemann.† Some portion of this tissue is also perceptible on the side of the end, or last septum, as a pellicle-like lining.

Identical characters can likewise be detected in a more perfect example in the richly-coloured Ardrossan limestone (Pl. III., fig. 3). This figure represents a partially oblique fractured section from the base upwards, cutting the interseptal tissue at more than one angle, and it further illustrates the dense nature of the corallum substance. On the upper side this specimen measures one and three-quarter inches by one and a quarter inches, the septal area varying from one to two-eighths of an inch in width. The inner perforated lamina, or wall-plate, is also visible (Pl. III,, figs. 2, 4, and 8). To this fossil I purpose applying the name of *Coscinocyathus Tatei*, in honour of Prof. Ralph Tate, F.L.S., of Adelaide University, to whose kindness I am indebted for an opportunity of describing these interesting fossils.

Genus Protopharetra.

This name was applied by Dr. Bornemann‡ to bodies from the Sardinian limestones, regarded by him as the "lower or vegetative state of development of forms of *Archæocyathus* and *Coscinocyathus*." Dr. Hinde, on the other hand, is not satisfied "that these fossils are merely the lower state of development of *Archæocyathus* forms," as very small specimens of both *Protopharetra* and *Archæocyathus* are present in the same hand specimens.

A detailed diagnosis of this genus has not been given by Bornemann, but Hinde describes it thus :—"It includes bodies of very varying forms, either cylindrical or growing in extended masses, from which simple or furiated stems are given off. The stems have a tube-like, axial cavity, crossed by tabulæ . . . and bounded by the porous walls. These consist of a delicate, fibrous, calcareous tissue, of dull, nearly opaque, milk-white aspect in thin sections. The fibres may be cylindrical or flattened, and they anastomose with each other . . . ."

The forms now referred to *Protopharetra* occur but sparingly at Kanyka, associated with *Ethmophyllum Hindei*, as round or oval, more or less cylindrical bodies, possessing a central cavity, surrounded by a zone of rather dense vermicular tissue, and when viewed with a low power closely resemble Bornemann's figures of *P. densa*§ and *P. radiata*.‖ The tubular cavity occupies but a

* *Loc. cit.*, t. 25, f. 2.
† *Ibid*, t. 24, f. 5.
‡ *Loc. cit.*, p. 46.
§ *Loc. cit.*, t. 8, f. 6 and 7.
‖ *Ibid*, t. 7, f. 1 and 2.

small space as compared with that of *Ethmophyllum* and *Coscinopora*, and in fact is not continuous longitudinally throughout the corallum. The figures represented in Pl. II., figs. 5 and 7, are taken from the same specimen, the latter with the centre filled by tissue from near the base of the corallum, and the former taken at a point much higher up, at points which in *Ethmophyllum* would be occupied by the inner and outer perforated laminæ, at the periphery and around the central cavity. The intermedial tissue consists of thickened irregular walls of granular calcite, enclosing oval or oblong spaces, or without regular form. In these walls a dense dark, and at times broken, line is visible (Pl. II., fig. 6), apparently of the nature of a primordial wall; the interspaces are all filled with clear calcite. A radial arrangement of the tissue is here and there visible, assuming a septa-like appearance as in *P. radiata*, Bornemann.* Towards the base of the cylinder the tubular cavity becomes filled with tissue, and that round the periphery enormously thickened (Pl. II., fig. 7). Tabulæ have not presented themselves to view. The fibrous structure of the walls is visible in Pl. II., fig. 6, and there are many other peculiar features which I am not at present prepared to explain. For instance, the so-called proper wall is broken through by pore-like channels of communication, without a corresponding piercing of the secondary fibrous thickening. In other places are a few pores or vertical canals cut across and filled with clear calcite.

The material before me is not sufficient in quantity for the proper elucidation of this form, but I propose to provisionally name it *Protopharetra (?) Scoulari*, in memory of one of the investigators of South Australian geology, hoping to return to a more detailed study of it at some future time.

Genus Girvanella.

In 1878 Dr. H. A. Nicholson and the writer established† the genus *Girvanella* for flexuous or contorted microscopic tubuli, circular in section, and forming loosely compacted masses.

The tubes are apparently simple cylinders, without perforations and destitute of partitions. The tubes of the type species *G. problematica* are from 1-600th to 1-700th of an inch in diameter, twisted together in loosely reticulate or vermiculate aggregations of a rounded or irregular shape. *G. problematica* is characteristic of a Lower Silurian horizon in the South-East of Scotland, known as the Craighead Limestone. Dr. J. G. Hinde has shown,‡ however, that Dr. Bornemann has redescribed similar

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**Loc. cit.*, t. 7, f. 1 and 2.

† Mon. Silurian Foss., Girvan in Ayrshire, 1878, fascie 1, p. 23.

‡ Geol. Mag., 1887, IV., p. 227.

bodies from the Sardinian Cambrian rocks as *Siphonema*, referring it to the calcareous Algæ!

The further history of *Girvanella* has been admirably worked out by Prof. H. A. Nicholson* and Mr. E. Wethered,† but it does not bear on the subject now before us.

In one of the sections of the limestone occur a number of vermiform bodies represented in Pl. II., fig. 8, consisting of tubes intertwined and crossing one another in all directions. Some are seen in longitudinal section, others obliquely so, and others again transversely. No absolutely clear connection can be traced between the tubes and the cavity of the *Ethmophyllum* or *Cosciniocyathus* within which they are nestling. Without unduly asserting these tubes to be those of *Girvanella*, which they very closely resemble, and taking the whole circumstances into consideration, the identity is even probable, and I do not see any other solution of their structure. I have only studied them so far by means of thin sections prepared for the microscope, and even in this condition there are certain anomalous features difficult of explanation. Chief amongst these are the large circular tubes seen here and there, and which are certainly foreign to the structure of the original *Girvanella*, but the want of organic connection with either of the corals described renders it in my mind quite possible that the tubes may be those of *Girvanella*. The general appearance of this organism, when magnified, closely resembles that of *E. (Siphonema) incrustans*, Bornemann.‡

Geological Position.

So far as I am aware the age of the fossiliferous rocks at Kanyka and the Blinman has not been investigated [The siliceous limestones of the Flinders Range are known to overlie unconformably the metamorphic rocks which occupy the country to the eastward bordering on the New South Wales frontier.—Ed.], or at any rate published. As already pointed out, however, Mr. Otto Tepper, acting on the suggestion of Prof. Tate, has classed the Ardrossan limestone as Lower Silurian, a point later confirmed by Prof. Tate§ himself. Mr. Gavin Scoular, in his paper on "The Geology of the Hundred of Munno Para,"‖ states the age of the rocks forming the Adelaide chain and Munno Para Hills as Pre-Silurian. Again, Dr. Henry Woodward, when describing¶ the Trilobites found by Mr. Tepper, under the names of *Dolicho-*

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* *Ibid*, 1888, V., p. 22.
† *Ibid*, 1889, VI., p. 199.
‡ *Loc. cit.*, t. 2, f. 2.
§ Jour. R. Soc. S. Australia for 1883-84 (1885), VII., p. 76.
‖ *Ibid* for 1879-80 (1880), III., p. 110.
¶ Geol. Mag., 1884, III., p. 344.

metopus Tatei and *Conocephalites australis*, says they are "clearly of Lower Silurian age, being equivalent to the Swedish, Bohemian, Tasmanian, and North American beds with similar fossils." He refers later to the resemblance of these Trilobites to similar species described by myself from Tasmania* and by Prof. James Hall from the Potsdam sandstone of New York State. The Tasmanian beds I had already relegated to the horizon of the Potsdam, or its British equivalent; and the inference to be drawn from Dr. Woodward's remarks, although he simply says Lower Silurian, is to the same effect. Now the Potsdam Sandstone is Cambrian, and I think we may with all reason refer the Ardrossan marble to the same horizon, and by induction the Kanyka and Blinman beds also.

DESCRIPTION OF THE PLATES.

Plate II.

ETHMOPHYLLUM HINDEI, *sp. nov.*

Fig. 1. Portion of a transverse section of the septal area, showing the septa and the secondary deposit lining them. Wirrialpa

2. Nearly complete transverse section of a corallum, showing the general appearance and proportions of the parts, and the interseptal loculi traversed by a single line of dissepiment-like divisions. Kanyka × 1½.

3. Imperfect transverse section, with vesicular canals of the inner lamina of the septal area cut across. Blinman ... ... × 2.

4. Four septa of another example highly magnified, showing the foregoing structure in a more marked condition. Wirrialpa.

PROTOPHARETRA (?) SCOULARI, *sp. nov.*

5. Transverse section of a small corallum, with a central vacuity as in *Ethmophyllum*, but the septal arrangement lost in a mass of dense vermicular tissue. Kanyka ... ... × 3.

6. Highly magnified portion of the tissue, showing a ramifying primordial wall (?), surrounded by a dense secondary deposit, enclosing oval, oblong, or irregular spaces.

7. Transverse section of the same individual (fig. 5) taken from a lower position in the corallum, with the central vacuity filled by vermicular tissue, but the peripheral portion resolved into a septal area as in *Ethmophyllum* and *Coscinocyathus*. Kanyka ... ... × 3.

GIRVANELLA, *sp. ind.*

8. Portion of a section showing a number of vermiform bodies cut at various angles, which may be of the nature of this genus.

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* Papers and Proc. R. Soc. Tas. for 1882 (1883), p. 157.

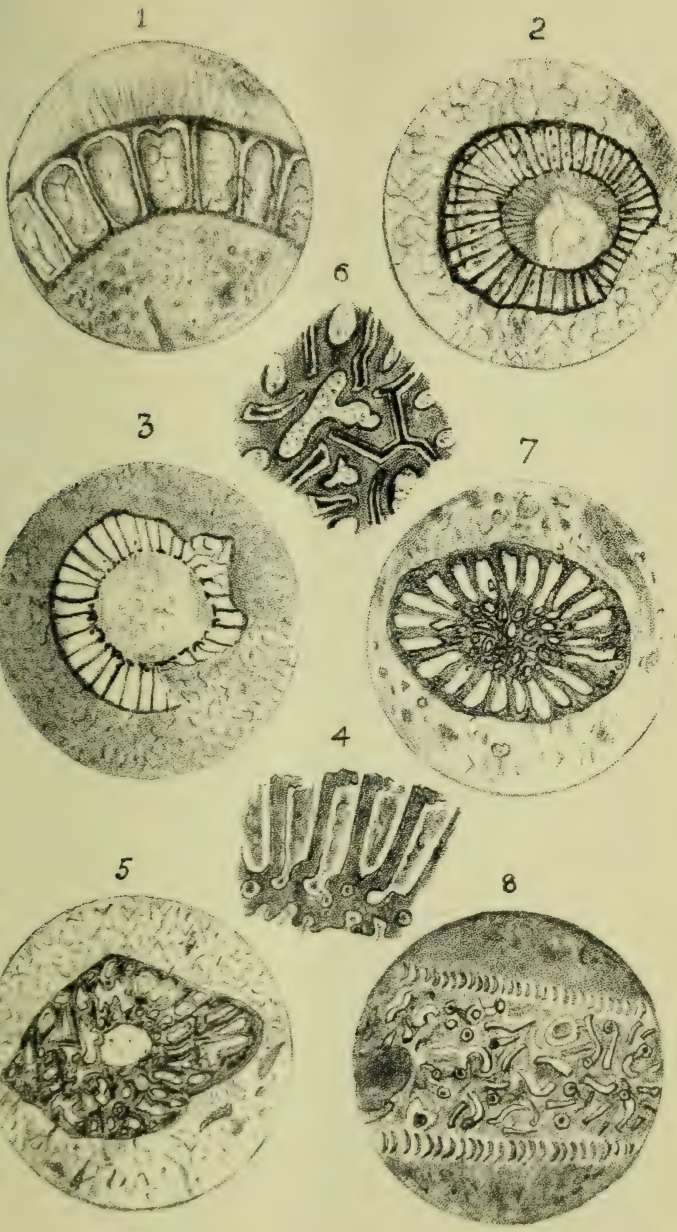
Plate III.

Coscinocyathus Tatei, *sp. nov.*

1. A mass of light grey to cream-coloured limestone with portions of the septal areas as cut at various angles. Wirrialpa. Nat.
2. Transverse section of a large corallum showing the septal area, and inner perforated lamina. Ardrossan. Nat.
3. The same example seen partly in oblique-horizontal, and partly oblique-vertical natural fractured sections, with the septal area, inner perforated lamina, and an external tissue, which may perhaps represent the outer perforated lamina. Ardrossan. Nat.
4. Three septa and inner perforated lamina of fig. 2 ... ... × 5.
5. Portion of a naturally weathered specimen, showing the outer ends of the septa seen longitudinally, covered by a portion of the outer perforated lamina. Kanyka. Nat.
6. Five septa of fig. 5 to show the interpolation of new septa by bifurcation, and the perforations of the outer lamina arranged in from three to four perforations to each septum ... ... × 3.
7. A small portion of the septal area of another specimen with remains of the cribriform interseptal tissue. Wirrialpa ... ... × 5.
8. Fragment of another example with the inner ends of six septa exposed and partially covered by the inner perforated lamina. Wirrialpa × 2.

Ethmophyllum Hindei, *sp. nov.*

9. Transverse section of a corallum. Wirrialpa. Nat.
10. A small weathered corallum seen partly horizontally, partly in vertical or longitudinal section, to show the central plug of matrix and limited number of septa. Kanyka ... ... × 2.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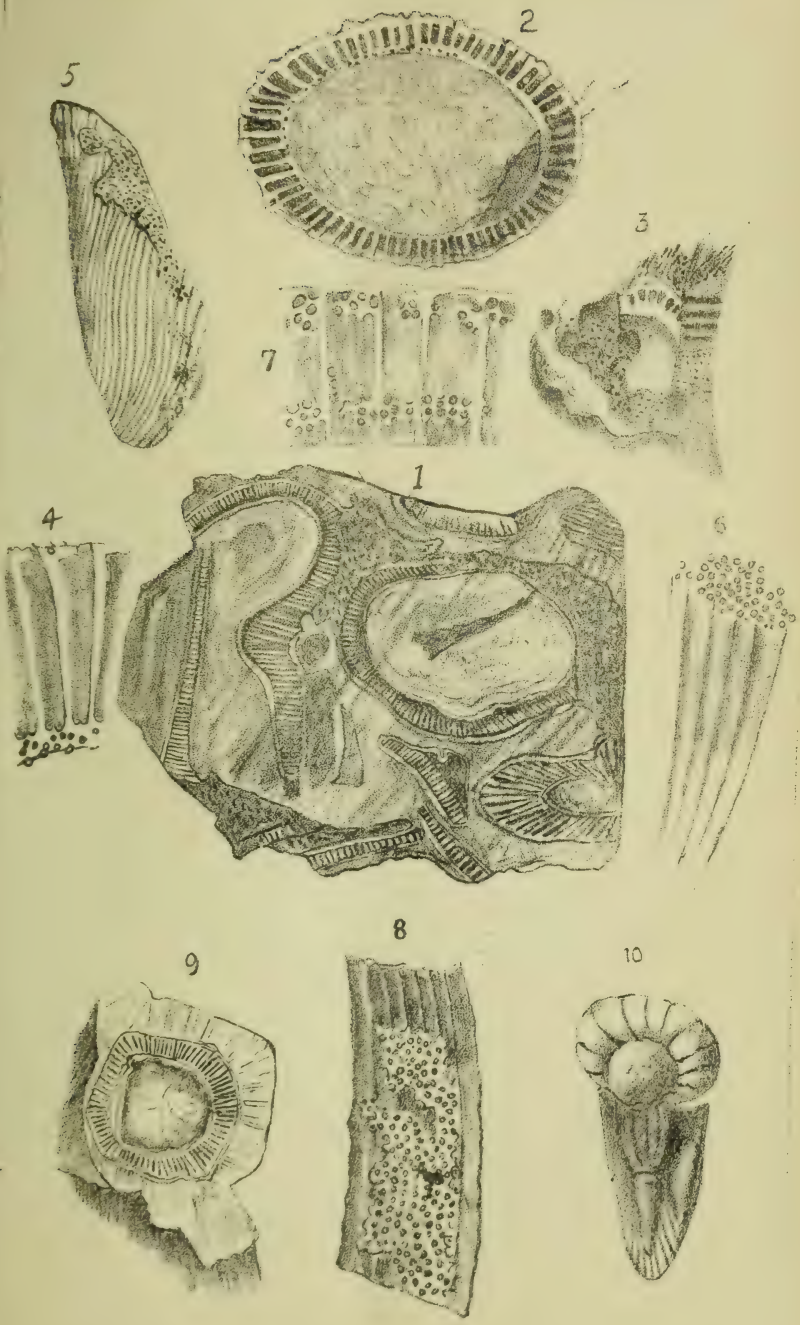
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Descriptions of Australian Lepidoptera.

By E. Meyrick, B.A., F.E.S.

Part I.

[Read December 3rd, 1889.]

I have selected for the subject of this paper one of the families of the *Tineina*, which contains some of the largest and most characteristically Australian species of that group. The more specially developed genera are further remarkable through the curious habits of the larvæ, which have no parallel in any other family of the *Lepidoptera*. The perfect insects are often very retired in habit; and it is probable that when local collectors turn their attention more carefully to the discovery and rearing of the larvæ, many additional species will be found. It is the object of papers such as these to stimulate the search for these insects by enabling collectors to identify the species which they possess, and indicating the direction in which fresh investigations may be made.

XYLORYCTIDÆ.

Head smooth or with more or less loosely appressed hairs; ocelli absent; tongue developed. Antennæ $\frac{2}{3}$—$\frac{3}{4}$, in male pectinated, ciliated, or simple, basal joint without pecten. Labial palpi recurved, terminal joint pointed. Maxillary palpi very short, more or less appressed to tongue. Abdomen in male with uncus developed, variable in length. Forewings with vein 1 furcate towards base, 7 and 8 stalked or rarely separate or coincident, 11 from middle of cell. Hindwings as broad or generally broader than forewings, trapezoidal to ovate, 1*b* clothed with long hairs above towards base, shortly furcate at base, 3 and 4 from a point or stalked, 6 and 7 stalked or approximated towards base, 8 connected with upper margin of cell by a short bar.

Most related to the *Oecophoridæ;* probably the two families are parallel developments from a common source; they are analogous in many respects, but are easily separated by the neuration of the hindwings. None of the *Xyloryctidæ* possess the basal pecten of the antennæ, which is so common in the *Oecophoridæ*.

Whether this family is represented to any extent outside Australia, I am not at present able definitely to say. One species alone is found in New Zealand; it is an Australian insect, which has perhaps made its way thither within recent times. Perhaps some exotic forms described under the name of *Cryptolechia* are

to be referred here; but I am indebted to Lord Walsingham for pointing out that the original type of Zeller's *Cryptolechia* belongs in fact to the *Oecophoridæ*. It is therefore impossible to employ for this family the name *Cryptolechiadæ*, which I formerly used for it, and I have renamed it accordingly. It consists of a group of Australian genera which are intimately connected together; and even if it should be found hereafter that many South American and African forms are capable of being placed with them, they would probably not interrupt the close connection of the Australian genera, and any systematic change that might be necessary would perhaps be rather in the direction of a widening of the family characters.

The structure of the head is essentially identical with that of the *Oecophoridæ*. The neuration of the forewings is also identical in the typical forms, except that vein 2 is commonly much more widely remote from the angle of cell; but there is a wider range of structure, since there can be no question that the forms in which veins 7 and 8 are separate are rightly included. The hindwings are almost always relatively broader, and the neuration as described contains the essential points of distinction of the family; but I may say that the connecting bar between vein 8 and the cell, often very short when these are close together, is by no means so conspicuous a structure as might be supposed, and may very readily be passed over, especially when near the base; I have however satisfied myself that it is invariably present.

The following is a tabulation of the genera:—

1. Antennæ of male bipectinated. 2.
   " ciliated or simple. 3.
2. Forewings with vein 7 absent (coincident with 8). 2. *Pilostibes.*
   " " present. 3. *Cryptophaga.*
3. Hindwings with veins 6 and 7 separate. 4.
   " " from a point or stalked. 8.
4. Thorax crested. 10. *Notosara.*
   " smooth. 5.
5. Hindwings in male with long costal hair-pencil from base. 8. *Crypsicharis.*
   " without costal hair-pencil. 6.
6. Terminal joint of palpi longer than second. 7. *Phthonerodes.*
   " " not longer than second. 7.
7. Posterior tibiæ rough-haired. 9. *Lichenaula.*
   " smooth-scaled. 6. *Catoryctis.*
8. Hindwings in male with very long costal hairs towards base. 9.
   " without long costal hairs. 10.

9. Forewings with vein 7 absent (coincident with 8).		19. *Hypertricha*
" " present.		18. *Procometis*
10. Forewings with veins 7 and 8 separate.		21. *Ayriophara*
" " stalked.		11.
11. Forewings with veins 3 and 4 stalked.		20. *Phylomictis.*
" " separate.		12.
12. Forewings with vein 7 to hind margin.		13.
" " apex or costa.		15.
13. Thorax crested.		13. *Tymbophora.*
" smooth.		14.
14. Antennal ciliations of male $1\frac{1}{2}$—2.		14. *Xylorycta.*
" " $\frac{1}{2}$.		15. *Telecrates.*
15. Posterior tibiæ smooth-scaled.		1. *Uzucha.*
" rough-haired.		16.
16. Abdomen stout, sides with dense projecting hairs.		4. *Maroga.*
" moderate, normal.		17.
17. Anterior tibiæ and tarsi much dilated with scales.		5. *Compsotorna.*
" " normal.		18.
18. Forewings with vein 7 to costa.		17. *Scieropepla.*
" " apex.		19.
" " $\frac{1}{4}$—$\frac{1}{2}$.		20.
19. Antennal ciliations of male 1.		11. *Clerarcha*
20. Hindwings with veins 6 and 7 from point, inner margin hairy.		12. *Plectophila.*
Hindwings with veins 6 and 7 moderately stalked, inner margin not hairy.		16. *Chalarotona.*

1. Uzucha, *Walk.*

Head with appressed scales; ocelli absent; tongue developed. Antennæ moderate, in male filiform, simple, basal joint very elongate, subclavate, without pecten. Labial palpi short, curved, ascending, second joint with loosely appressed scales, terminal joint short, smooth, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen stout. Posterior tibiæ smooth-scaled. Forewings with vein 1 very long-furcate towards base, 2 from $\frac{3}{5}$, 3 from angle, 7 and 8 short-stalked, 7 to apex, 11 from middle. Hindwings over 1, subovate; 1*b* shortly furcate at base, with basal tuft of hairs, 3 and 4 from a point or short-stalked, 5 parallel to 4, 6 and 7 short-stalked, 8 connected with upper margin of cell at a point before middle.

A very distinct and curious genus; the peculiarly arched costa of the imago gives it a very Tortriciform appearance.

1. *Uz. humeralis*, Walk.

(Uzucha humeralis, Walk., 826.)

Male and female 42-61mm. Head dull orange-ochreous. Palpi dark fuscous, apex of second joint pale ochreous. Antennæ and thorax fuscous. Abdomen dark fuscous, base of segments and two whole apical segments ochreous-orange. Legs rather dark fuscous, apex of tarsal joints obscurely whitish-ochreous. Forewings oblong, slightly narrowed posteriorly, costa very strongly and abruptly arched near base, thence slightly arched or almost straight, apex obtuse, hindmargin nearly straight, hardly oblique, rounded beneath; fuscous, slightly purplish-tinged, sometimes reddish-tinged in disc; extreme costal edge pale reddish-ochreous; a semicircular dark reddish-fuscous spot on base of costa, margined posteriorly with pale reddish-ochreous; base of inner margin pale ochreous; a very small deep ferruginous or reddish-fuscous spot in disc at $\frac{2}{3}$; cilia fuscous, terminal half pale reddish-ochreous. Hindwings rather dark fuscous, apical $\frac{2}{3}$ pale ochreous-yellowish, division suffused; cilia pale ochreous-yellowish, becoming dark fuscous towards anal angle and on inner margin.

Duaringa and Brisbane, Queensland, in November; rather common in the larval state, but apparently less frequent as imago. Larva 16-legged, stout, cylindrical, head large; dull slaty-grey, spots small, blackish; head blackish; it feeds on the bark of *Eucalyptus*, gnawing it externally beneath a broad shelter of silk and refuse. Pupa in a chamber excavated in solid bark. I found the larva nearly full grown in September.

2. Pilostibes, n. g.

Head with appressed hairs; ocelli absent; tongue short. Antennæ moderate, in male shortly bipectinated throughout, basal joint moderate, rather swollen, without pecten. Labial palpi long curved, ascending, second joint thickened with dense scales, more or less rough or almost tufted towards apex beneath, terminal joint shorter than second, with appressed scales, acute. Maxillary palpi very short, appressed to tongue, Thorax smooth. Abdomen moderate. Interior tibiæ and tarsi thickened with dense scales; posterior tibiæ rough-haired above and beneath. Forewings with vein 1 long-furcate towards base, 2 from $\frac{3}{5}$, 3 from angle, 7 absent (coincident with 8), 8 to costa, 11 from middle. Hindwings $1\frac{1}{4}$, oblong-ovate; base below median, and inner margin clothed with long hairs, 1*b* shortly furcate at base, 3 and 4 from a point or stalked, 5 parallel to 4, 6 to 7 from a point or short-stalked, 8 connected with upper margin of cell at a point before middle.

Certainly a development of *Cryptophaga*.

Forewings with dark reddish-fuscous central spot. 2. *stigmatias*.
" without such spot. 3. *enchidias*.

2. *Pil. stigmatias*, n. sp.

Female 44-46mm. Head and palpi brown, terminal joint fuscous-whitish. Antennæ brownish, more whitish towards base. Thorax whitish-brown, with a blackish-fuscous transverse anterior spot. Abdomen whitish-fuscous, with a ferruginous band before middle, anal segment dark fuscous above. Legs brown. Forewings elongate-oblong, costa moderately arched, apex obtuse, hindmargin straight, rather oblique ; pale brownish-ochreous irrorated with dark fuscous, costal half suffused with ochreous-brown ; a moderate transverse oblong-oval very dark reddish-fuscous slenderly whitish-margined central spot, lower extremity becoming black and produced into a slender acute outwardly oblique tooth : cilia whitish-fuscous irrorated with ochreous-brown, with a fuscous subbasal and apical ferruginous line. Hindwings fuscous, lighter towards base ; a darker hind-marginal line ; cilia fuscous-whitish.

Newcastle, New South Wales ; two specimens (Austr. Mus.).

3. *Pil. enchidias*, n. sp.

Male 32mm. Head whitish-ochreous. Palpi brownish-ochreous, terminal joint and apex of second white. Antennæ brownish-ochreous. Thorax pale ochreous, mixed on back with blackish. Abdomen whitish-ochreous. Legs ochreous-whitish, anterior pair suffused with dark fuscous internally. Forewings elongate, moderate, costa moderately arched, apex pointed, hindmargin sinuate beneath apex, oblique, rounded beneath ; whitish-ochreous ; a strong fuscous longitudinal streak, mixed with blackish, from base below costa to disc before middle, with two short oblique teeth from its upper edge, and its apex connected by a short line with an oblique linear blackish dot in disc beyond middle ; a short blackish longitudinal dash beneath apex of this streak ; a fine blackish line inner margin from $\frac{1}{3}$ to anal angle : cilia whitish, with a strong blackish line near base, tips fuscous-tinged at anal angle and blackish at apex. Hindwings whitish-yellowish ; cilia white.

Newcastle and Sydney, New South Wales ; in November, two specimens.

3. Cryptophaga, Lw.

Head with appressed hairs ; ocelli absent ; tongue short. Antennæ moderate, in male bipectinated throughout or nearly, basal joint moderate, swollen and densely scaled above, without pecten. Labial palpi moderately long, curved, ascending, second joint with dense appressed scales, somewhat rough beneath, terminal joint shorter than or rarely as long as second, smooth or slightly roughened anteriorly, acute or tolerably pointed. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen stout, sides more or less clothed with dense projecting hairs

or scales. Anterior and middle tibiæ densely rough-scaled, anterior tarsi slightly thickened with scales, posterior tibiæ densely rough-haired above and beneath. Forewings with vein 1 long-furcate towards base, 2 from $\frac{2}{3}$–$\frac{5}{6}$ or rarely almost from angle, 3 from angle, 7 and 8 stalked, 7 to hindmargin, 11 from middle. Hindwings over 1, oblong-ovate; towards base below median, and towards inner margin densely clothed with long hairs, vein 1*b* shortly furcate at base, 3 and 4 from a point or short-stalked, 5 parallel to 4, 6 and 7 from a point or short-stalked or rarely separate but closely approximated at base, 8 connected with cell at a point towards base.

The name of this genus is printed *Cryptophasa* by Lewin, but the second part of this word is meaningless, whilst the habits of the larvæ show clearly that Lewin intended the name as I have written it; I have therefore made the correction. No confusion need occur with the Coleopterous genus *Cryptophagus*, since the different termination is a sufficient distinction.

The genus is distinguished from all but *Pilostibes* by the pectinated antennæ of the male. In most of the species the larvæ excavate tunnels into the solid wood of trees, within which they reside, closing the entrance with a barricade of silk and refuse; from these they emerge by night and bite off entire leaves, which they drag into the burrow for food. The barricade is evidently intended not to conceal the entrance, for it is rather conspicuous, but as a bulwark against ants, which are the worst enemies of all larvæ. These large larvæ are not only a favourite food of the natives, but are also frequently eaten by whites, either raw or roasted, and are much esteemed by those who can get over early prejudices. The peculiar habits are, however, not invariable in the genus, and some of the smaller species show still those simpler and more usual methods of life, from which this more elaborate system has been developed.

The perfect insects are in general rarely met with at large, although the larvæ are often common. I believe the species flourish in the drier districts, where other *Lepidoptera* are scarce; and it is probable that judicious research will hereafter largely add to their number.

1. Hindwings yellow, orange, or ocherous. 2.
   " not " " " 5.
2. Forewings with ground colour white. 9. *porphyrinella*.
   " " " not white 3.
3. Forewings without marking. 16. *phaëthontia*.
   " with darker markings. 4.
4. Forewings with base of cilia spotted with black. 20. *rubra*.
   " " " not " " 15. *rubescens*.

5. Hindwings brown-reddish. 17. *russata.*
" not " 6.
6. Hindwings wholly white, except sometimes hindmarginal dots. 7.
" not wholly white 11.
7. Forewings with three large, black, discal dots. 8.
" without " " " 9.
8. Abdomen partially blackish 25. *delocentra.*
" not " " 24. *Pultenaeæ*, female (part).
9. Forewings with yellowish line along submedian fold. 18. *flavolineata.*
" without " " " " " 10.
10. Forewings irrorated with black 14. *spilonota.*
" not " " " 19. *epadelpha.*
11. Hindwings partially white. 12.
" not " " 17.
12. Hindwings blackish or dark grey towards base. 13.
" white towards base. 15.
13. Forewings with ground colour white. 14.
" " " " whitish-ochreous. 21. *lurida.*
14. Forewings with grey hindmarginal fascia. 11. *albicosta.*
" without " " " 24. *Pultenaeæ*, male.
15. Hindwings with coppery-purple hindmarginal fascia. 10. *ecclesiastis.*
" without " " " " 16.
16. Forewings grey. 13. *leucadelpha.*
" white. 24. *Pulteaenæ*, female (part).
15. Forewings with ground colour white 4. *hierastis.*
" " " " not white. 18.
18. Forewings with white costal streak. 8. *proleuca.*
" without " " " 19.
19. Forewings pale greyish-ochreous 22. *sarcinota.*
" grey or fuscous. 20.
20. Abdomen with well-defined red band near base. 23. *balteata.*
" without " " " " " 21.
21. Abdomen dark fuscous. 22.
" fuscous-whitish 23.
22. Forewings, with transverse black lines. 7. *epigramma.*
" without " " " 12. *irrorata.*
23. Forewings with three darker discal dots; vein 2 from near angle. 5. *dolerastis.*
" " about seven " " ; vein 2 from $\frac{2}{3}$ of cell. 6. *stochastis.*

4. *Crypt. hierastis*, n. sp.

Female 22-23mm. Head, palpi, antennæ, thorax, and abdomen white ; posterior extremity of thorax greyish. Legs dark fuscous, posterior tibiæ white. Forewings elongate, costa gently arched, apex rounded, hindmargin obliquely rounded ; 2 from near angle ; glossy snow-white ; a narrow dark fuscous streak along costa from before middle to apex, finely attenuated anteriorly ; a moderate dark fuscous streak along inner margin from near base to anal angle : cilia white, at apex and towards anal angle fuscous-grey. Hindwings with veins 6 and 7 from a point ; light fuscous, hindmarginal edge darker ; cilia white.

York, West Australia ; three specimens bred in December. The larva feeds on *Hakea* (an unidentified species with leaves metamorphosed into stout spines), making long contorted tubes of silk covered with refuse amonst the twigs, in October.

5. *Crypt. dolerastis*, n. sp.

Male 31mm. Head and thorax grey. Palpi grey-whitish, irrorated with dark-grey. Antennæ grey-whitish. Abdomen ochreous-grey-whitish. Legs dark fuscous irrorated with whitish, posterior tibiæ whitish. Forewings elongate, moderate, costa gently arched, slightly sinuate beyond middle, apex obtuse, hindmargin obliquely rounded ; 2 from near angle ; light ashy-grey, irrorated with dark-grey ; a cloudy dark-grey dot in disc at $\frac{2}{5}$, traces of a second beneath it, and a third, larger but ill-defined, in disc at $\frac{2}{3}$; a very indistinct transverse darker shade at $\frac{5}{6}$; a hindmarginal series of blackish dots : cilia light grey. Hindwings with veins 6 and 7 from a point ; fuscous, becoming paler and more whitish towards base ; cilia whitish, with a dark-grey line.

Geraldton, West Australia ; one specimen bred, which emerged some months after my return to England. Larva 16-legged, cylindrical, with short, scattered, blackish hairs ; grey, irregularly tinged with reddish and greenish, becoming dull greenish beneath ; spots small, whitish ; head dark brown, marbled with whitish-ocherous ; feeds on *Banksia* (an unidentified species with leaves 3 to 4 inches long, oblong-linear, margins serrate, apex emarginate), amongst the spun-together leaves of terminal shoots, in October. This larval habit, reminding one of the *Tortricina*, is quite exceptional in the genus. The species is closely similar to the following, but differs in shape of wing and neuration, as well as in details of marking.

6. *Crypt. stochastis*, n. sp.

Both sexes 27-33mm. Head grey-whitish. Palpi whitish, sprinkled with dark grey. Antennæ whitish, pectinations in male whitish-ochreous. Thorax grey-whitish, posteriorly greyer, posterior extremity mixed with blackish. Abdomen fuscous-whitish.

Legs dark fuscous irrorated with whitish, posterior tibiæ whitish above. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin rather obliquely rounded; 2 from $\frac{2}{3}$; ashy-grey, thinly sprinkled with blackish; a dark grey dot near base in middle; about five indistinct cloudy dark-grey dots in a longitudinal series in disc from $\frac{1}{4}$ to $\frac{3}{4}$, the last subcrescentic; a small cloudy subquadrate dark-grey spot beneath fourth dot, sometimes connected indistinctly with third: cilia ashy-grey. Hind-wings with veins 6 and 7 from a point or short-stalked; fuscous, base paler and whitish-tinged; cilia fuscous, tips and a row of median points whitish.

York, West Australia; four specimens bred in December. Larva feeds on *Hakea* (the same species as *C. hierastis*), living in a barricaded tunnel and carrying in the spines for food, in October.

7. *Crypt. epigramma*, n. sp.

Female 34mm Head, antennæ, and thorax dark fuscous. Palpi whitish, irrorated with dark fuscous. Abdomen dark-grey, mixed with orange-reddish towards base of segments. Legs dark fuscous, apex of joints whitish, posterior tibiæ grey-whitish. Forewings oblong, costa moderately arched on basal half, thence straight, apex obtuse, hindmargin sinuate beneath apex, not oblique, rounded beneath; 2 from $\frac{2}{3}$; dark ashy fuscous; veins more or less distinctly marked with fine black lines; a narrow blackish streak along basal third of inner margin; a fine transverse black line from $\frac{1}{4}$ of costa, terminated by median vein; a second similar line from costa before middle, reaching $\frac{3}{4}$ across wing: cilia dark ashy fuscous. Hindwings with veins 6 and 7 from a point; fuscous, darker towards hindmargin; cilia fuscous-whitish, with a dark fuscous subbasal line.

Mount Lofty, South Australia; one specimen taken by Mr. E. Guest.

8. *Crypt. proleuca*, n. sp.

Male 19 mm. Head and palpi ochreous-whitish, slightly sprinkled with ferruginous. Antennæ fuscous, mixed with whitish. Thorax ochreous-whitish, irrorated with brown. Abdomen whitish-ochreous, posterior margin of segments bright orange. Legs ochreous-fuscous, middle and posterior tibiæ whitish. Forewings oblong, costa slightly arched, apex rounded, hind margin oblique, slightly rounded; 2 from $\frac{3}{4}$; fuscous, towards inner and hind margin sprinkled with whitish and dark fuscous; a moderate sharply-marked snow-white streak along costa from near base to $\frac{5}{6}$, attenuated anteriorly to a point, beneath bordered by a broad ochreous-brown band from base to $\frac{3}{4}$; an ill-defined small roundish dark fuscous spot beneath middle of disc, suffusedly

margined with whitish, and a second, unmargined, in disc at $\frac{4}{5}$: cilia fuscous, base sprinkled with white. Hindwings with veins 6 and 7 separate; fuscous, rather darker posteriorly; cilia whitish, with a subbasal dark fuscous line.

Quorn, South Australia; one specimen in October.

9. *Crypt. porphyrinella*, Walk.

(*Cryptolechia porphyrinella*, Walk. 771.)

Female 29 mm. Head and thorax white, sides of face dark fuscous. Palpi white, second joint dark fuscous except apex. Antennæ dark fuscous. Abdomen ochreous-yellow. Legs deep ochreous-yellow, anterior pair dark fuscous. Forewings elongate, moderate, posteriorly somewhat dilated, costa gently arched, apex rounded, hind margin somewhat oblique, gently rounded; 2 from $\frac{2}{3}$; white; a broad, straight, dark purple-fuscous longitudinal median streak from base of costa, dilated towards posterior extremity so as to extend on hind margin from above middle to anal angle, upper edge with a broad triangular projection before middle; a rather narrow purple-blackish fascia along hind margin from apex to beneath anal angle, marked with seven small semi-oval golden-ochreous spots on hind margin: cilia rather dark grey, basal half whitish with a broad black subbasal line. Hindwings with veins 6 and 7 separate; ochreous-yellow; a narrow dark fuscous streak along upper half of hindmargin, dilated at apex; cilia ochreous-yellow, round apex grey with a black subbasal line.

Newcastle and Sydney, New South Wales, in February; two specimens.

10. *Crypt. ecclesiastis*, Meyr.

(*Cryptophasa ecclesiastis*, Meyr., Proc. Linn. Soc. N. S. Wales, 1886, 1040.)

Female 66 mm. Head and thorax white. (Palpi broken.) Antennæ fuscous. Abdomen white, above with a broad black transverse band before middle, and five slender black rings between that and apex, apical scales yellowish-tinged. Legs white, anterior and middle tibiæ banded with black, all tarsi black with white rings. Forewings elongate-oblong, costa bent before middle, apex rounded, hind margin rather oblique, hardly rounded; 2 from $\frac{2}{3}$; shining white; a narrow coppery hind marginal fascia, forming alternate purple and golden spots: cilia white, barred with dark fuscous. Hindwings with vein 6 and 7 from a point; shining white; a narrow coppery-purplish hindmarginal fascia; cilia white.

Fernshaw, Victoria; one specimen.

11. *Crypt. albicosta*, Lw.

(*Cryptophasa albacosta*, Lw., Ins. N. S. Wales, Z. Linn. Ent. IX., 350 [rect. *albicosta*].)

Both sexes 40-56 mm. Head, antennæ, and thorax white; antennal pectinations of male pale ochreous. Palpi white, base dark fuscous above. Abdomen rather dark grey, sides, apex, and segmental margins white. Legs white, anterior tarsi dark fuscous with white rings. Forewings oblong, posteriorly slightly dilated, costa slightly arched, apex rounded, hind margin hardly oblique, nearly straight, rounded beneath; 2 from $\frac{2}{3}$; shining white; a very large subtriangular grey blotch, more or less suffused with ochreous-brown and sprinkled with black, resting on inner margin from before $\frac{1}{3}$ to $\frac{5}{6}$, its apex nearly touching costa near base; a minute black grey-circled dot in disc at $\frac{2}{5}$, resting on posterior margin of blotch; a grey sometimes white-centred reniform spot in disc at $\frac{2}{3}$; a more or less developed grey fascia from middle of disc, and another from beyond reniform spot, not rising above it, confluent below it and running into posterior angle of blotch, variable in breadth, rarely broadened to coalesce with hindmarginal fascia; a moderate light grey hindmarginal fascia, including a brownish-ochreous hindmarginal line, preceded by a row of black dots circled with ochreous-whitish: cilia whitish, with an ochreous-fuscous subbasal and paler grey posterior line. Hindwings with veins 6 and 7 from a point or short-stalked; rather dark fuscous-grey; a cloudy white streak along upper half of hindmargin, dilated into a spot at apex; cilia white.

Newcastle and Sydney, New South Wales; Melbourne, Victoria; Georges Bay, Tasmania; bred in November and December rather commonly, but not taken at large. Larva 16-legged, rather stout, wrinkled, cylindrical, with long scattered whitish hairs, head with two blunt spines on forehead, and other shorter ones towards mouth, second segment large; grey-whitish, finely wrinkled transversely with blackish-grey, segmental divisions suffused with dark grey; segments 5-12 with a transverse elongate brownish-red dorsal spot towards anterior margin, interrupted in middle, an oblong-ovate oblique brownish-red spot on side, spiracles black, a slender longitudinal black wrinkled subspiracular line, beneath which are three smaller ochreous-red spots in an inverted triangle, two upper ovate, lower more elongate; fourth segment with dorsal spot much smaller, two other very small spots behind it, and an irregularly double spot on side before spiracles, besides the other lateral spots; third segment with a large irregular ochreous-reddish spot on each side of back posteriorly, a similar one below it anteriorly, and usual lateral spots; second segment reddish-ochreous-brown; head

black; anal segment brownish-ochreous: feeds on *Banksia serrata*, *Ceratopetalum gummiferum*, and *Callicoma serratifolia*, residing in a barricaded tunnel in the branches and carrying in leaves for food, from September to December. Although the foodplants are of very remote Natural Orders, it is unquestionably the same species which feeds on these apparently very different foods.

12. *Crypt. irrorata*, Lw.

(*Cryptophasa irrorata*, Lw., Ins. N. S. Wales.)

Both sexes 43-58mm. Head and thorax grey, or whitish mixed with grey, more or less sprinkled with dark fuscous. Palpi whitish, sprinkled with dark fuscous. Antennæ grey-whitish, pectinations in male ochreous. Abdomen rather dark fuscous. Legs dark fuscous, sprinkled with whitish. Forewings oblong, posteriorly slightly dilated, costa in male straight, in female gently arched, apex rounded, hind margin somewhat oblique, gently rounded; 2 from $\frac{2}{3}$; grey, more or less sprinkled with ferruginous and brown, and coarsely irrorated with black; a small darker spot in disc before middle, and a second beneath first; an obscure pale dark-margined reniform spot in disc at $\frac{2}{3}$, connected with costa beyond middle by an indistinct streak; a row of more or less marked dark fuscous spots along hind margin and posterior half of costa: cilia fuscous-grey, with two darker lines. Hindwings with veins 6 and 7 from a point or short-stalked; rather dark fuscous; cilia whitish, with a fuscous line, and indistinct traces of fuscous bars.

Newcastle and Sydney, New South Wales; Melbourne and Warragul, Victoria; bred tolerably commonly in December. Larva 16-legged, stout, cylindrical, with scattered long whitish hairs, second segment large; dull white, segmental divisions blackish; segments 5-12 each with a slender black transverse central wrinkle, two elongate-oval transverse ochreous-red spots on back near anterior margin, some scattered black depressed dots, forming short longitudinal lines on sides above spiracles, an oblique-oval ochreous-red spiracular spot bordered beneath by a blackish mark, and three roundish ochreous-red spots placed in an inverted triangle below spiracles; fourth segment with dorsal spots much smaller and more remote, each followed by a slender oblique-transverse blackish line, lateral spots as usual, but upper anterior of subspiracular spots much larger and approximated to spiracular; third segment similar to fourth, but with two additional elongate-oval transverse ochreous-red spots on back near posterior margin; second segment whitish, anteriorly brownish-tinged, with a broad dark fuscous irregular median band, attenuated beneath, interrupted on back; head blackish, with two short blunt prominences on forehead, and other smaller ones

towards mouth; twelfth segment with two additional small ochreous-red spots on back on posterior margin; and segment whitish, speckled with black: feeds on *Casuarina suberosa*, residing in a barricaded tunnel in main branches, and carrying in twigs for food, in November.

13. *Crypt. leucadelpha*, Meyr.

(*Cryptophasa leucadelpha*, Meyr., Proc. Linn. Soc., N.S. Wales, 1886, 1040.)

Both sexes 41-46mm. Differs from preceding only as follows:—Abdomen grey-whitish; hindwings white, with moderately broad suffused fuscous hind marginal fascia not reaching anal angle.

Wimmera, Victoria; two specimens. Larva feeds on *Casuarina*.

14. *Crypt spilonata*, Scott.

(*Cryptophasa spilonata*, Scott, Austr. Lep. 10, pl 3.)

Female 45mm. Head, palpi, antennæ, thorax, abdomen, and legs white; anterior tarsi with base of four apical joints dark grey. Forewings oblong, posteriorly dilated, costa gently arched, apex obtuse, hind margin sinuate, hardly oblique, rounded beneath; 2 from $\frac{2}{3}$; pale whitish-grey, slightly fuscous-tinged, irrorated with black; traces of a small darker spot in disc at $\frac{3}{5}$: cilia whitish. Hindwings with veins 6 and 7 from a point; white; cilia white.

Newcastle and Sydney, New South Wales; two specimens bred in November. Larva residing in a barricaded tunnel in branches of *Banksia serrata*, carrying in leaves for food, in October.

15. *Crypt. rubescens*, Lw.

(*Cryptophasa rubescens*, Lw., Ins. N.S. Wales.)

Male 45mm. Head ochreous-white. Palpi white, second joint reddish-tinged above. Antennæ ochreous, base white. Thorax reddish-ochreous, anteriorly rosy-tinged. Abdomen and legs ochreous-orange, anterior legs ochreous-reddish. Forewings oblong, posteriorly slightly dilated, costa slightly arched, apex obtuse, hind margin slightly sinuate, hardly oblique, rounded beneath; 2 from $\frac{3}{4}$; ferruginous, irrorated with elongate light brownish-ochreous scales; costa broadly suffused with pale ochreous from base to beyond middle, attenuated to a point posteriorly; a short obscure dark fuscous dash or submedian fold at $\frac{1}{4}$, and another beyond middle; a small roundish ill-defined dark fuscous spot in disc at $\frac{2}{3}$, and another at $\frac{3}{4}$, more elongate: cilia ferruginous. Hindwings with veins 6 and 7 from a point or short-stalked; ochreous-orange, somewhat paler posteriorly; cilia light orange, becoming ferruginous around apex.

Duaringa and Brisbane, Queensland; Newcastle and Sydney, New South Wales; bred not uncommonly in November. Larva

residing in a barricaded tunnel in stems of *Acacia longifolia*, carrying in the phyllodia for food, in August and September.

16. *Crypt. phaëthontia*, n. sp.

Female 41mm. Head, palpi, antennæ, thorax, and legs ochreous-reddish. Abdomen whitish-ochreous irrorated with reddish. Forewings elongate, moderate, costa moderately arched, apex obtuse, hind margin not oblique, rounded beneath ; 2 from $\frac{3}{4}$; deep brown-reddish; cilia dark reddish-fuscous. Hindwings with veins 6 and 7 from a point; pale ochreous, slightly reddish-tinged; cilia pale ochreous, reddish-tinged, tips obscurely whitish.

Duaringa, Queensland ; one specimen received from Mr. G. Barnard.

17. *Crypt. russata*, Butl.

(*Cryptophasa russata*, Butl., Proc. Zool, Soc., 1877, 475.)

Male 33mm. Head white. Thorax deep brown-red, anteriorly whitish. Abdomen brown-reddish. Forewings elongate, moderate, costa slightly arched, apex obtuse, hind margin slightly rounded, somewhat oblique ; deep fuscous-red, somewhat lighter towards costa ; a white streak along costa from base to $\frac{2}{3}$, posteriorly attenuated. Hindwings brown-reddish.

Cape York, Queensland ; one specimen in the British Museum, from which this diagnosis is taken, Butler's original description being in part erroneous.

18. *Crypt. flavolineata*, Walk.

(*Cryptolechia flavolineata*, Walk., 749.)

Female 50mm. Head and palpi white. Antennæ white, base of stalk yellowish. Thorax white, with a central longitudinal yellow line. Abdomen white, second segment dull brown-red. Legs white, anterior and middle tibiæ ochreous-yellow above. Forewings oblong, posteriorly rather dilated, costa gently arched, apex obtuse, hindmargin straight, slightly oblique, rounded beneath ; 2 from $\frac{2}{3}$; snow-white ; a faint pale yellowish central longitudinal line from before middle of disc almost to hind margin; a suffused ochreous-yellow line along submedian fold from base to anal angle; a short slender ochreous-yellow streak along inner margin about $\frac{1}{5}$: cilia white, terminal half ochreous-yellow. Hindwings with veins 8 and 5 from a point; snow-white ; cilia white.

Sydney, New South Wales, in October ; one specimen. I suspect the larva to feed on *Eucalyptus*.

19. *Crypt. epadelpha*, n. sp.

Female 45mm. Head, palpi, antennæ, and thorax white. Abdomen white, second segment dull orange-red. Legs white, anterior tarsi with base of four apical joints blackish. Forewings

oblong, somewhat dilated posteriorly, costa moderately arched, apex obtuse, hindmargin rounded, somewhat oblique; 2 from $\frac{2}{3}$; snow-white; a hindmarginal series of small black dots: cilia white. Hindwings with veins 6 and 7 from a point; snow-white; upper half of hindmargin marked with blackish dots; cilia white.

Brisbane, Queensland; one specimen bred in November. Larva residing in a barricaded tunnel in branches of *Tristania conferta*, carrying in leaves for food, in September.

20. *Crypt. rubra*, n. sp.

Male 50mm, Head pale ochreous, crown reddish. Palpi whitish-ochreous, base reddish-fuscous. Antennæ fuscous. Thorax ochreous-red. Abdomen pale ochreous, second segment dull red. Legs whitish-ochreous, banded with black. Forewings oblong, posteriorly slightly dilated, costa slightly arched, apex obtuse, hind margin rather obliquely rounded; 2 from $\frac{5}{6}$; ochreous-red, deeper towards costa and inner margin anteriorly; a dark fuscous dot in disc beyond $\frac{1}{3}$, a second on fold beneath middle, a third in disc at $\frac{3}{5}$, and a fourth between second and third: cilia grey, with a red basal line, basal half spotted with black. Hindwings with veins 6 and 7 short-stalked; pale yellowish-ochreous, apex slightly reddish-tinged; cilia whitish-ochreous.

Ardrossan, South Australia; one specimen in November.

21. *Crypt. lurida*, n. sp.

Female 58mm. Head, palpi, and thorax whitish-ochreous. Antennæ blackish. Abdomen blackish, sides of segments white at base, second segment dull red on back, anal segment whitish-ochreous. Legs whitish-ochreous, tarsi black with white rings on apex of joints. Forewings oblong, posteriorly somewhat dilated, costa moderately arched, apex obtuse, hindmargin rather obliquely rounded; 2 from $\frac{4}{5}$; whitish-ochreous, towards inner margin anteriorly slightly brownish-tinged; a black dot in disc at $\frac{1}{3}$, a second on fold beneath middle, and two others obliquely transversely placed in disc at $\frac{3}{5}$, lower anterior: cilia whitish-ochreous, with a basal row of black dots. Hindwings with veins 6 and 7 from a point; white; basal half blackish, division suffused; cilia white, on anal angle and inner margin blackish.

Mount Lofty, South Australia; one specimen received from Mr. E. Guest. Larva residing in a barricaded tunnel in stems of *Eucalyptus viminalis* ("white gum"), carrying in leaves for food.

22. *Crypt. sarcinota*, n, sp.

Both sexes 35-53mm. Head and thorax whitish-ochreous. Palpi white, second joint dark fuscous above towards base. Antennæ in male fuscous, in female whitish. Abdomen blackish, sides and segmental margins ochreous-whitish, basal and apical

segments pale whitish-ochreous, second segment orange-red above. Legs ochreous-whitish, tarsal joints black towards base. Forewings oblong, posteriorly slightly dilated, costa slightly arched, apex obtuse, hindmargin straight, rather oblique; 2 from $\frac{1}{5}$; pale greyish-ochreous, brownish-tinged; a large black dot in disc at $\frac{1}{3}$, a second on fold beneath middle, and two others transversely obliquely placed, and sometimes connected by a fine line in disc at $\frac{3}{5}$, lower anterior; a row of black dots along hindmargin and apical half of costa: cilia pale greyish-ochreous, basal half barred with blackish on hindmarginal dots. Hindwings with veins 6 and 7 from a point or short-stalked; fuscous, tinged with blackish towards basal third, base with ochreous-whitish hairs; cilia whitish-fuscous, with a blackish-grey line near base, in female on upper half of hindmargin reduced to a row of dots.

Duaringa, Queensland; several specimens received from Mr. G. Barnard.

23. *Crypt. balteata*, Walk.

(*Zitua balteata*, Walk. Suppl., 1841.)

Male 28-32mm. Head and palpi whitish-ochreous. Antennæ blackish. Thorax whitish-ochreous, becoming fuscous posteriorly. Abdomen blackish, second segment orange-red above, anal segment pale ochreous. Legs whitish-ochreous, tarsi and posterior tibiæ black with white apical rings. Forewings oblong, costa slightly arched, apex obtuse, hindmargin obliquely rounded; 2 from $\frac{5}{6}$; dark fuscous-grey; a black dot in disc beyond $\frac{1}{3}$, a second on fold beneath middle, and two others obliquely transversely placed in disc at $\frac{3}{5}$, lower anterior: cilia dark grey, with a basal series of black spots. Hindwings with veins 6 and 7 from a point; dark fuscous, basal half blackish; cilia light fuscous with a dark fuscous basal line, towards anal angle blackish.

Mount Lofty, South Australia; two specimens received from Mr. E. Guest. Larva residing in a barricaded tunnel in stems of *Eucalyptus* ("stringy-bark"), carrying in leaves for food.

24. *Crypt. Pultenaeæ*, Lw.

(*Cryptophasa pultenaeæ*, Lw., Ins. N. S. Wales).

Both sexes 26-37mm. Head, palpi, antennæ, and thorax white; terminal joint of palpi $\frac{2}{3}$ of second. Abdomen white, second segment orange-red. Legs black, ringed with white, middle and posterior tibiæ white. Forewings oblong, posteriorly somewhat dilated, costa gently arched, apex obtuse, hindmargin slightly oblique, somewhat rounded; 2 from $\frac{2}{3}$; shining snow-white; a black dot in disc at $\frac{1}{3}$, and two others transversely placed in disc at $\frac{3}{5}$, lower somewhat posterior; a row of small black spots along hindmargin and apical fourth of costa: cilia white. Hindwings with veins 6 and 8 from a point; in male blackish, hindmargin

white; in female shining white, sometimes with a blackish mark in disc and more or less suffused with blackish-grey; a hindmarginal series of small black spots; cilia white.

Newcastle and Sydney, New South Wales; several specimens, from December to February. Larva residing in a barricaded tunnel in stems of *Pultenaea villosa*, carrying in leaves for food.

25. *Crypt. delocentra*, n. sp.

Female 40mm. Head whitish-ochreous. Palpi white, terminal joint $\frac{1}{4}$ of second. Antennæ black. Thorax white, anteriorly ochreous-tinged. Abdomen blackish, sides and segmental margins white, basal segment white, second segment orange-red. Legs black, ringed with white. Forewings oblong, posteriorly slightly dilated, costa gently arched, apex obtuse, hindmargin rather obliquely rounded; 2 from $\frac{3}{4}$; shining snow-white; a large black dot in disc beyond $\frac{1}{3}$; and two others transversely placed in disc at $\frac{2}{3}$, lower rather posterior; a row of small black spots along hindmargin and apical fourth of costa: cilia white. Hindwings with veins 6 and 7 from a point; snow-white; a hindmarginal row of small black spots; cilia white, basal half indistinctly barred with dark fuscous on hindmarginal spots.

Sydney, New South Wales; one specimen bred in December. Larva residing in a barricaded tunnel in young branches of *Ceratopetalum gummiferum*, carrying in leaves for food, in October.

4. Maroga, *Walk.*

Head with appressed scales; ocelli absent; tongue short. Antennæ moderate, in male flatly dentate or filiform, shortly ciliated ($\frac{1}{2}$), basal joint somewhat swollen, without pecten. Labial palpi moderately long, curved, ascending, second joint with appressed scales, slightly rough beneath, terminal joint about half second, smooth, acute. Maxillary palpi very short. Thorax smooth. Abdomen stout, sides clothed with projecting hairs. Anterior tarsi and tibiæ more or less thickened with scales, middle tibiæ rough-haired above, posterior tibiæ densely rough-haired above and beneath. Forewings with vein 1 long-furcate towards base, 2 from $\frac{3}{5}$, 3 from angle, 4 and 5 closely approximated at base, 7 and 8 stalked, 7 to apex or costa, 11 from middle. Hindwings over 1, oblong-ovate, towards base below median and towards inner margin densely clothed with long hairs, 1 *b* shortly furcate towards base, 3 and 4 from a point or short-stalked, 5 tolerably parallel, 6 and 7 from a point or short-stalked, 8 connected with cell at a point towards base.

1. Hindwings light orange. 28. *mythica.*
" white or fuscous 2.

2. Forewings irrorated with linear blackish scales.
27. *setiotricha.*

" not " " " " "
26. *unipunctana.*

26. *Mar. unipunctana*, Don.

(*Tortrix unipunctana*, Don., Ins. N. Holl.; *Maroga gigantella*, Walk. 827.)

Both sexes 39-74mm. Head in male ochreous-white, in female light ochreous. Palpi dark fuscous, second joint more or less ochreous beneath. Antennæ dark fuscous. Thorax in male ochreous-white, in female light greyish-ochreous or fuscous. Abdomen dark fuscous, sides and margin of segment and anal tuft deep orange. Legs dark fuscous, middle and posterior tibiæ orange, posterior tarsi in male white. Forewings oblong, costa in male slightly, in female gently arched, apex obtuse, hindmargin rather obliquely rounded; in male shining snow-white, in female pale whitish-grey or light fuscous; a black dot in disc at $\frac{2}{3}$, variable in size, sometimes almost obsolete: cilia in male white, in female whitish or pale fuscous. Hindwings in male white, sometimes greyish-tinged on inner margin, in female fuscous, darker towards inner margin; cilia in male white, in female fuscous or whitish-fuscous, sometimes becoming white around apex.

Duaringa and Brisbane, Queensland; Newcastle and Sydney, New South Wales; Melbourne, Victoria; Mount Lofty, South Australia; Geraldton, West Australia; common, from October to December. Larva residing in a barricaded tunnel in stems of *Acacia decurrens*, *A. longifolia*, and other species of the genus, carrying in leaves or phyllodia for food, in September.

27. *Mar. setiotricha*, n. sp.

Both sexes 56-66mm. Head and thorax pale greyish-ochreous. Palpi dark fuscous. Antennæ grey. Abdomen dark purplish-fuscous, sides and anal tuft orange. Legs dark fuscous, middle and posterior tibiæ orange, posterior tarsi suffused with white towards apex of joints. Forewings elongate-oblong, costa almost straight, apex obtuse, hindmargin nearly straight, somewhat oblique, rounded beneath; grey-whitish, strewn with numerous long fine linear blackish scales; a blackish dot in disc at $\frac{3}{5}$: cilia white, base with a few fuscous and dark fuscous scales. Hindwings in male iridescent whitish, in female fuscous, darker towards base, apex paler; cilia white, in female more or less infuscated towards base.

Duaringa, Queensland; two specimens received from Mr. G. Barnard.

28. *Mar. mythica*, n. sp.

Both sexes 36-41mm. Head and thorax shining pale greyish-ochreous. Palpi dark red-brown, terminal joint whitish. Antennæ whitish, base dark reddish-fuscous. Abdomen ochreous-orange. Anterior legs dark fuscous, middle legs dark red-brown, tarsi dark fuscous, posterior legs ochreous-orange, tarsi pale ochreous. Forewings elongate, moderate, costa slightly arched, rather abruptly excavated from $\frac{2}{3}$ to near apex, apex acute, hindmargin little oblique, rather deeply excavated on upper half, rounded beneath ; surface somewhat wrinkled transversely, pale ochreous, towards inner and hind margin somewhat brownish-tinged ; costa and inner margin narrowly suffused with yellowish-brown ; a round black dot in disc at $\frac{2}{3}$: cilia whitish-ochreous, terminal half red-brown towards apex. Hindwings light ochreous-orange ; cilia pale yellowish, rosy-tinged, terminal half becoming brown-red round apex.

Sydney, New South Wales ; three specimens in December. These were all taken on the stem of an old pear-tree in a garden, but I observed no indications of the larva.

5. Compsotorna, n. g.

Head with appressed hairs ; ocelli absent ; tongue short. Antennæ moderate, in male filiform, moderately ciliated (1), basal joint moderate, without pecten. Labial palpi long, recurved, second joint with appressed scales, terminal joint about half second, smooth, acute. Maxillary palpi very short. Thorax smooth. Abdomen moderate. Anterior tibiæ and tarsi much dilated with dense rough scales, posterior tibiæ rough-haired above and beneath. Forewings with vein 1 long-fuscate towards base, 2 from $\frac{1}{4}$, 3 from angle, 7 and 8 stalked from a point with 9, 7 to apex, 11 from middle. Hindwings 1, oblong-ovate, towards base below median and towards inner margin clothed with long hairs, 1*b* very shortly furcate at base, 3 and 4 from a point, 5 parallel, 6 and 7 from a point, 8 connected with cell at a point near base.

29. *Comps. oligarchica*, n. sp.

Male 22mm. Head and thorax ochreous-whitish, sides of face ochreous. Palpi whitish, second joint externally fuscous. Antennæ fuscous. Abdomen ochreous-whitish, posterior half of second segment dull red. Legs whitish, anterior pair whitish-ochreous. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin not oblique, rounded beneath ; whitish ochreous, with a few fine scattered black scales; a fuscous-grey straight longitudinal streak above middle from base to near apex, margined beneath first with blackish and then with an ochreous suffusion, and above and posteriorly by a white suffusion

reaching almost to costa; a triangular reddish-brown spot in disc at $\frac{2}{3}$, with a central transverse pale mark, its upper side rounded and whitish-margined, intersecting the fuscous longitudinal streak, its two lower sides black-margined; cilia whitish-ochreous. Hindwings and cilia whitish-ochreous.

Toowoomba, Queensland; one specimen in December.

6. Catoryctis, n. g.

Head smooth; ocelli absent; tongue well-developed. Antennæ moderate, in male filiform or serrate, shortly ciliated ($\frac{1}{4}$—$\frac{1}{2}$), basal joint moderate, without pecten. Labial palpi very long, recurved, second joint with appressed scales, terminal joint as long as second, slender, smooth, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ with appressed scales. Forewings with vein 1 furcate towards base, 2 from $\frac{2}{3}$, 3 from angle, 7 and 8 stalked, 7 to apex, or rarely 7 absent (coincident with 8), 11 from middle. Hindwings over 1, trapezoidal-ovate, 1*b* clothed with long hairs towards base, shortly fuscate at base, 3 and 4 from a point or short-stalked, 5 parallel, 6 and 7 approximated at base, 8 connected with cell at a point near base.

The species of this genus are probably all attached to *Casuarina*, and have the longitudinally striped colouration necessary for concealment among the slender twigs of that tree.

1. Forewings with white median streak interrupted transversely. 2.
" " " not " 3.
2. Subcostal streak reaching to middle. 32. *subnexella.*
" " " much beyond middle. 31. *eugramma.*
3. Hindwings whitish-ochreous. 30. *subparallela.*
" grey. 33. *tricrena.*

30. *Cat. subparallela*, Walk.

(*Oecophora subparallela*, Walk., 690; *Oec. nexella*, *ib.*, 692; *Oec. fissulella*, *ib.*, 1032.)

Male 17-21mm. Head light shining ochreous, sides white. Palpi pale ochreous, terminal joint and apex of second whitish. Antennæ white, annulated with fuscous. Thorax white, anterior margin and a lateral stripe pale ochreous. Abdomen whitish-ochreous. Legs light ochreous, anterior pair fuscous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin faintly sinuate, oblique; 7 absent; brownish-ochreous, golden-tinged; a slender silvery-white attenuated streak immediately beneath costa from near base to beyond middle; a

whitish line from beneath this at $\frac{1}{3}$ to costa at $\frac{3}{4}$, and another from beneath this beyond middle to costa before apex; a moderately broad straight entire silvery-white longitudinal median streak from base to apex; a similar narrower parallel streak from inner margin at $\frac{1}{3}$ to hind margin below middle: cilia greyish-ochreous, darker on costa, cut by ill-defined white bars on longitudinal streaks, on anal angle wholly white. Hindwings whitish-ochreous, anal angle yellow-ochreous; cilia whitish-ochreous.

Sydney, New South Wales; several specimens taken and bred, in November and February. Larva feeding between joined twigs of *Casuarina suberosa*, in October.

31. *Cat. eugramma*, n. sp.

Both sexes 25-26mm. Head light shining ochreous, sides white. Palpi ochreous-whitish. Antennæ white, annulated with fuscous. Thorax brownish-ochreous, with a white stripe on each side of back. Abdomen pale ochreous. Legs ochreous-whitish, anterior pair ochreous. Forewings elongate, costa strongly arched, apex tolerably pointed, hindmargin faintly sinuate, extremely oblique; 7 present; rather dark ochreous-brown; markings shining white; a moderate streak immediately beneath costa from near base to $\frac{5}{6}$, sometimes cut posteriorly by one or two longitudinal veins; a moderate streak, anteriorly attenuated, from disc at $\frac{1}{3}$ to apex; a slightly narrower streak from base along submedian fold to hind margin above anal angle, but posterior fourth reduced to two indistinct parallel lines; a slender somewhat irregular streak from inner margin near base to anal angle; a slender streak from inner margin at $\frac{1}{4}$, running near inner margin to beyond middle: cilia ochreous-brown, mixed with whitish, with a white apical bar (imperfect). Hindwings fuscous, paler towards base, in male with a rather broad hind marginal band, narrowed towards apex, of somewhat raised brownish-ochreous scales; cilia fuscous-whitish.

Sydney and Shoalhaven, New South Wales; in September, January, and February, four specimens.

32. *Cat. subnexella*, Walk.

(*Oecophora subnexella*, Walk., 691.)

Both sexes 16-23mm. Head iridescent-whitish, back of crown ochreous. Palpi with second joint light fuscous mixed with whitish, more whitish beneath, terminal joint fuscous with an indistinct whitish lateral line. Antennæ white, annulated with dark fuscous. Thorax fuscous, sometimes mixed with whitish on back, patagia iridescent towards apex. Abdomen whitish-ochreous. Legs whitish, anterior pair fuscous. Forewings elongate, costa moderately arched, apex round-pointed, hind mar-

gin straight, oblique; 7 present; fuscous, more or less ochreous-tinged; a white attenuated streak immediately beneath costa from base to middle; all veins tending to be marked posteriorly with whitish streaks, but generally very indistinct; a moderate straight silvery-white longitudinal median streak from base to apex, interrupted by a very oblique line of ground-colour before middle, lower edge emitting one or two short very oblique teeth on veins posteriorly; sometimes a small darker spot on lower margin of this at $\frac{2}{3}$; a slender whitish longitudinal streak from inner margin at $\frac{1}{4}$ to beyond middle, often almost entirely obsolete: cilia fuscous, mixed with paler, with a white basal spot at apex. Hindwings fuscous or grey, becoming lighter and sometimes ochreous-tinged towards base; cilia whitish, with a light fuscous line.

Sydney, New South Wales; Melbourne, Victoria; Geraldton and Perth, West Australia; in November, seven specimens.

33. *Cat. tricrena*, n. sp.

Male 20-21mm. Head white. Palpi white, second joint light greyish-ochreous above towards base. Antennæ fuscous, dotted with whitish, base white. Thorax white, anterior margin, a lateral stripe, and a narrow stripe on each side of back light fuscous. Abdomen whitish. Legs whitish, anterior pair fuscous. Forewings elongate, costa moderately arched, apex tolerably pointed, hindmargin faintly sinuate, oblique; 7 present; fuscous; a white streak from base immediately beneath costa, reaching costa at $\frac{1}{4}$, and continued along it to $\frac{2}{3}$, finely attenuated; one or two short whitish lines between veins towards costa posteriorly; a moderate straight white longitudinal median streak from base to apex, posterior fourth cut by a longitudinal fuscous line; three short white longitudinal lines between veins towards hindmargin; an ill-defined narrow whitish straight longitudinal streak from base of inner margin direct to anal angle, posteriorly confluent with a fine whitish line along submedian fold: cilia whitish, mixed with fuscous (imperfect). Hindwings grey; cilia grey-whitish.

Victor Harbour, South Australia, in November; two specimens received from Mr. E. Guest.

7. Phthonerodes, n. g.

Head smooth; ocelli absent; tongue well-developed. Antennæ moderate, in male filiform, simple, basal joint elongate, without pecten. Labial palpi extremely long, slender, recurved, second joint smooth, terminal joint longer than second, acute. Maxillary palpi very short. Thorax smooth. Abdomen moderate. Posterior tibiæ shortly rough-scaled above. Forewings with vein 1

furcate towards base, 2 from $\frac{3}{4}$, 3 from angle, 7 and 8 stalked, 7 to hindmargin, 11 from middle. Hindwings over 1, suboblong, apex produced and pointed, 1*b* and 1*c* densely haired towards base, 1*b* shortly furcate at base, 3 and 4 from a point or short-stalked, 5 parallel, 9 and 8 approximated at base, 8 connected with cell at a point before middle.

Appears to be a development of *Catoryctis*.

34. *Phthon. scotarcha*, n. sp.

Both sexes 13-21mm. Head and thorax dark fuscous, with a fine white streak above eyes. Palpi blackish, second joint with white longitudinal line on each side, terminal joint with a white a line in front. Antennæ white, annulated with blackish; abdomen grey, sides whitish-yellowish. Legs grey, irrorated with yellow-whitish, posterior tibiæ pale whitish-yellowish. Forewings elongate, costa strongly arched, apex round-pointed, hindmargin rather deeply sinuate, oblique; fuscous, densely irrorated with blackish-fuscous; a straight white dark-margined longitudinal line from base below middle, more or less nearly approaching hindmargin above anal angle, but suffused and indistinct posteriorly, interrupted by a small dark fuscous spot in middle: cilia dark fuscous, with partially indicated yellow-whitish bars. Hindwings light yellow; sometimes some fuscous scales at extreme apex; cilia whitish-fuscous, with a darker fuscous line near base.

Quorn and Wirrabara, South Australia, in October; taken plentifully on a fence beneath some *Eucalyptus*-trees during a gale.

8. Crypsicharis, n. g.

Head with appressed hairs; ocelli absent; tongue well-developed. Antennæ moderate, in male filiform, ciliated with fascicles (2), basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint with appressed scales, terminal joint shorter than second, slender, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above. Forewings with vein 1 furcate towards base, 2 from $\frac{3}{5}$, 3 from angle, 7 and 8 stalked, 7 to hind margin, 11 from middle. Hindwings 1, trapezoidal, apex round-pointed, costa in male with long pencil of hairs from base lying beneath inner margin of forewings, towards base below median and towards inner margin clothed with long hairs, 3 and 4 from a point, 5 parallel, 6 and 7 approximated towards base but widely separate, 8 connected with cell at a point before middle.

Doubtless an offshoot of *Lichenaula*.

35. *Cryps. neocosma*, n. sp.

Male 18-19mm. Head, palpi, antennæ, and thorax whitish-ochreous, slightly brownish-tinged. Abdomen whitish. Legs

brownish-ochreous, posterior pair whitish. Forewings elongate, costa gently arched, apex round-pointed, hind margin sinuate, oblique ; whitish-ochreous, becoming whitish towards costa, pale brownish towards inner margin, posteriorly with a few scattered brown scales ; a fuscous or dark fuscous dot on submedian fold before middle, and a second in disc at $\frac{2}{3}$; a triangular inwardly oblique cloudy fuscous or dark fuscous spot on inner margin immediately before anal angle : cilia whitish-ochreous, terminal half pale fuscous, on anal angle wholly light fuscous. Hindwings whitish, apex more or less tinged with grey ; cilia whitish.

Brisbane, Queensland ; two specimens in September.

9. Lichenaula, n. g.

Head smooth ; ocelli absent ; tongue well-developed Antennæ moderate, in male serrulate, ciliated ($\frac{1}{4}$—2), basal joint moderate, without pecten. Labial palpi very long, recurved, second joint with appressed scales, terminal joint somewhat shorter than second, slender, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 furcate towards base, 2 from $\frac{3}{4}$, 3 from angle, 7 and 8 stalked, 7 to hind margin or apex, 11 from middle. Hindwings over 1, trapezoidal-ovate, towards base below median and towards inner margin clothed with long hairs, 1*b* shortly furcate at base, 3 and 4 from a point or short-stalked, 5 parallel, 6 and 7 closely approximated at base, 8 connected with cell at a point before middle.

1. Forewings red-brown in disc. 36. *undulatella.*
   " not " 2.
2. Crown of head blackish. 38. *arisema.*
   " not " 3.
3. Thorax with a black anterior bar. 4.
   " without " 5.
4. Forewings with black bar from costa beyond middle to fold before middle. 39. *calligrapha.*
   Forewings without such bar. 40. *lichenea.*
5. Forewings with anterior half of costa broadly white. 37. *laniata.*
   " " " not white. 6.
6. Head clear white. 7.
   " more or less grey. 8.
7. Forewings oblong, hind margin rather oblique. 45. *mochlias.*
   " elongate, " very oblique. 42. *choriodes.*
8. Forewings with an ochreous suffusion in disc at $\frac{3}{4}$. 43. *tuberculata.*
   " without " " 9.

9. Forewings moderately broad, hind margin rather oblique. 44. *musica.*

" rather narrow, " very oblique. 41. *lithina.*

36. *Lich. undulatella*, Walk.

(*Cryptolechia undulatella*, Walk., 756.)

Male 18-21mm. Head, palpi, antennæ, and thorax grey; antennal ciliations $\frac{1}{4}$. Abdomen brownish. Anterior legs dark fuscous; middle and posterior pair white, tarsi fuscous, posterior tibiæ fuscous externally. Forewings elongate, moderate, costa gently arched, apex rounded, hindmargin straight, oblique; 7 to hindmargin; red-brown, becoming deeper on lower half; a rather broad white streak along costa from near base to near apex, attenuated to both extremities; a broad grey streak, sprinkled with brownish, along inner margin from base to anal angle, beyond middle forming a broad triangular projection upwards, reaching half across wing, thence abruptly attenuated; a darker transverse mark in disc at $\frac{2}{3}$; a slender strongly outwards-curved whitish line from costal streak at $\frac{2}{3}$ to inner margin before anal angle, indented above lower extremity, where it forms a small spot; a grey apical blotch, covering whole area beyond this line except a spot towards anal angle; a series of small dark fuscous spots along hindmargin and around apex: cilia light ochreous-brownish, with a white basal line. Hindwings fuscous, lighter and more ochreous-tinged anteriorly, hindmargin suffusedly darker; cilia yellow-whitish, with a grey line.

Sydney, New South Wales, in November and January; three specimens. Larva 16-legged, stout, cylindrical; dirty whitish, spots large, black; feeds in a stout gallery of silk and refuse along leaflets of *Acacia decurrens*, in October.

37. *Lich. laniata*, n. sp.

Both sexes 15-18mm. Head and thorax white. Palpi white, lower half of second joint dark fuscous. Antennæ white, annulated with fuscous, ciliations in male 2. Abdomen whitish. Legs white. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin faintly sinuate, oblique; 7 to hindmargin; ochreous-brown, irrorated with dark-brown; a very broad white streak, pointed at both ends, along costa from base to beyond middle; inner margin slenderly white towards base; an irregular white blotch along inner margin from $\frac{1}{4}$ to $\frac{3}{4}$, its upper anterior angle forming a projection towards base along fold, almost confluent with costal streak, its upper posterior angle forming a projection upwards, reaching half across wing; a dark fuscous dot in disc at $\frac{2}{3}$; a white transverse line, acutely angulated outwards in middle, from $\frac{3}{4}$ of costa to inner margin before anal angle, angula-

tion confluent with a suffused white spot on hindmargin, and sometimes also filled up anteriorly with a white suffusion; a white hindmarginal line: cilia white, at anal angle fuscous, at apex somewhat mixed with fuscous. Hindwings and cilia whitish-grey.

Sydney, New South Wales, in December and January; three specimens.

38. *Lich arisema*, n. sp.

Both sexes 13-16mm. Head white, crown blackish-fuscous. Palpi white, base dark fuscous. Antennæ white, annulated with dark fuscous, ciliations in male ½. Thorax white, sometimes yellowish-tinged, posterior extremity dark fuscous. Abdomen dark-grey, sides and apex whitish-yellowish. Legs whitish, anterior and middle pair banded with dark fuscous. Forewings elongate, costa gently arched, apex tolerably rounded, hindmargin obliquely rounded; 7 to hindmargin; whitish-ochreous or white; three moderately broad nearly straight blackish-fuscous fasciæ; first almost basal; second slightly curved, from middle of costa to beyond middle of inner margin, posterior edge sometimes with a short central projection; third hindmarginal, extending from apex almost to anal angle, narrowed to a point beneath, anterior edge sometimes angulated so as almost to touch preceding fascia in middle: cilia whitish-yellowish, with a dark fuscous line, sometimes somewhat mixed with dark fuscous except on anal angle. Hindwings, dark-grey; cilia whitish-yellowish, sometimes with a grey line.

Sydney, New South Wales; Mount Lofty, South Australia; three specimens in November and December.

39. *Lich. calligrapha*, n. sp.

Both sexes, 16-17mm. Head white. Palpi white, base of second joint, and base and apex of terminal joint black. Antennæ white, annulated with blackish, ciliations in male 1. Thorax white, anteriorly margin narrowly black, with a projection backwards on each side of back. Abdomen whitish. Legs white, anterior and middle pair banded with blackish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin nearly straight, oblique; 7 to apex; ochreous-white; markings black; a spot on base of costa, and another on inner margin near base; an irregular-edged streak from costa beyond middle to submedian fold before middle, its lower extremity almost confluent with a small spot in disc at ⅓; an erect mark from inner margin before anal angle, its apex acutely furcate; two small marks on costa towards apex, and some scattered black scales forming an apical suffusion: cilia ochreous-white, more or less distinctly barred with grey, with an interrupted blackish line. Hindwings whitish-

grey, more whitish anteriorly, apex grey; cilia grey-whitish, with traces of a darker line.

Sydney, New South Wales; Launceston, Tasmania; in November and January, three specimens.

40. *Lich. lichenea*, n. sp.

Both sexes 15-21mm. Head white. Palpi white, base of second joint, and base and apex of terminal joint blackish. Antennæ white, annulated with blackish, ciliations in male 1. Thorax white, sprinkled with black, and with a black transverse anterior spot on back. Abdomen grey or grey-whitish. Legs white, anterior and middle pair banded with blackish. Forewings elongate, costa gently arched, apex rounded, hind margin very obliquely rounded; 7 to apex or near below it; ochreous-white, with some scattered black scales; markings brown or grey, densely irrorated with black; a slender irregular oblique fascia near base, generally more or less broadly dilated on lower half; a moderate irregular spot on middle of inner margin; a dot in disc at $\frac{1}{3}$; a small spot in middle of disc, and a furcate mark on inner margin before anal angle, both often much enlarged and suffused so as to become confluent into a cloudy irregular fascia, connecting above with a small spot on costa beyond middle, whence proceeds an irregular somewhat outwards-curved transverse line, sometimes interrupted in disc, to rejoin ante-anal spot of inner margin; often a separate dot within enclosed space; two marks on costa towards apex; a suffused more or less developed subapical spot; a slender streak along hindmargin; all these markings very variable in size and suffusion: cilia ochreous-white, barred with grey, bars densely irrorated with black on basal half. Hindwings varying from rather dark grey to pale whitish-grey; cilia whitish, with a grey line.

Sydney, Bathurst (2,500 feet), and Cooma (3,000 feet), New South Wales; Melbourne, Victoria; common from November to April, at rest on fences and rocks. Larva 16-legged, moderate, cylindrical, with rather long scattered whitish hairs; grey; dorsal, subdorsal, lateral, and spiracular lines dark grey, irregular: spots moderate, black; head blackish; second segment whitish-grey, with a blackish divided plate; anal segment blackish: feeds on lichen-dust on fences and rocks, forming a tunnel in a crevice for shelter, and feeding beneath a gallery of web and refuse, in August and September. The species is a very variable one, and the varieties show some tendency to be localised.

41. *Lich. lithina*, n. sp.

Male 14mm. Head, palpi, and thorax white, sprinkled with fuscous. Antennæ white, annulated with fuscous, ciliations 1.

Abdomen whitish. Legs white, anterior pair dark fuscous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, hindmargin very obliquely rounded ; 7 to apex ; white, thinly and irregularly irrorated with black ; a pale fuscous suffusion, forming a very indistinct blotch on anterior half of inner margin, a spot on inner margin before anal angle, a spot on costa beyond middle and another at $\frac{4}{5}$, all very faint and obscure : cilia white, irrorated with fuscous, appearing to form obscure darker bars, with an irregular row of black points. Hindwings whitish, with a bluish tinge, veins and hindmargin obscurely grey ; cilia whitish, with faint traces of two grey lines.

Blackheath (3,500 feet), New South Wales ; one specimen in January.

42. *Lich. choriodes*, n. sp.

Both sexes 14-22mm. Head and antennæ white, ciliations in male almost 2. Palpi white, second joint dark fuscous towards base. Thorax white, with some dark fuscous scales, and a small posterior dark fuscous spot. Abdomen whitish. Legs white, anterior pair dark fuscous, middle pair spotted with dark fuscous. Forewings elongate, costa gently arched, apex round-pointed, hind margin very obliquely rounded ; 7 to apex or near below it ; white, more or less densely irrorated with fuscous, and generally partially with black ; markings ill-defined, formed by confluence of this irroration ; a narrow transverse streak near base, not reaching costa ; a triangular blotch on inner margin before middle, apex generally more blackish, reaching more than half across wing, ground colour above this blotch generally clear-white without irroration ; a cloudy spot on costa beyond middle and another at anal angle, nearly confluent ; two dark fuscous transversely placed sometimes confluent dots in disc at $\frac{2}{3}$; a more or less indicated pale angulated subterminal line, preceded and followed by darker suffusion : cilia whitish, with two cloudy fuscous lines, on costa indistinctly barred. Hindwings light fuscous, more whitish-fuscous towards base ; cilia whitish, with a cloudy fuscous line.

Rosewood, Queensland ; Sydney, New South Wales ; Melbourne, Victoria ; in December and February, rather common on fences. Larva feeding on lichen-dust on fences, beneath a gallery of web and refuse, forming a tunnel in a crevice for shelter, in September. This species is also a very variable one.

43. *Lich. tuberculata*, n. sp.

Both sexes 19-27mm. Head grey-whitish or grey. Palpi white, irrorated with dark fuscous. Antennæ grey, sprinkled with white, ciliations in male $\frac{1}{4}$. Thorax grey, sometimes mixed with blackish. Abdomen fuscous-whitish. Legs white, more or less

densely irrorated with dark fuscous. Forewings elongate, costa moderately arched, apex rounded, hindmargin very obliquely rounded; 7 to apex; ashy-grey, with scattered whitish scales; veins partially marked with slender blackish lines, most distinctly in disc and towards hindmargin, elsewhere hardly perceptibly; the white scales tend to form streaks in disc along these lines, and sometimes one or two small indistinct spots before middle of disc; two black dots transversely placed in disc at $\frac{2}{3}$, lower rather anterior, connected by a white posteriorly blackish-margined mark, followed by a cloudy roundish brownish-ochreous suffusion; some blackish scales forming an indistinct subapical suffusion: cilia whitish, with fuscous bars irrorated with black. Hindwings fuscous, more whitish-fuscous and ochreous-tinged anteriorly, hindmargin darker; cilia fuscous-whitish, with a fuscous basal line.

Sydney, New South Wales; in October and November, three specimens. Larva 16-legged, rather stout, cylindrical, with scattered hairs; whitish-grey; sides somewhat marbled with dull obscure purplish; spots moderate, raised, black; head rough, black; second segment reddish-brown, paler posteriorly, with a suffused black transverse band. Feeds on *Crowea saligna*, residing in a barricaded tunnel in fork of stem, and drawing up leaves for food, in September.

44. *Lich. musica*, n. sp.

Both sexes 17-20mm. Head greyish-ochreous mixed with white. Palpi white, more or less irrorated with greyish-ochreous. Antennæ whitish, obscurely annulated with grey, ciliations in male $1\frac{1}{2}$. Thorax greyish-ochreous, mixed with white and sprinkled with black. Abdomen grey-whitish. Legs whitish, anterior and middle pair suffusedly banded with dark fuscous. Forewings elongate, moderate, costa moderately arched, apex obtuse, hindmargin rather oblique, nearly straight, rounded beneath; 7 to hindmargin; greyish-ochreous, irrorated with white; some scattered black scales, tending to form more or less distinct streaks on veins, especially near hindmargin beneath apex, where in male they form a conspicuous triangular patch; a short indistinct outwardly oblique darker streak from inner margin at $\frac{1}{4}$; obscure indications of a cloudy somewhat darker fascia from middle of costa to inner margin before anal angle; two black dots transversely placed in disc at $\frac{2}{3}$, followed by a small obscure white suffusion; cilia whitish, mixed with ochreous, and barred with blackish irroration. Hindwings fuscous, paler towards base; cilia fuscous-whitish, with a fuscous line.

Port Lincoln, South Australia; Geraldton and Perth, West Australia; in November, three specimens.

45. *Lich. mochlias*, n. sp.

Female 26mm. Head white. Palpi white, terminal joint and upper half of second irrorated with dark fuscous. Antennæ whitish. Thorax whitish, irrorated with dark fuscous. Abdomen ochreous-whitish. Legs white, anterior and middle pair irrorated with dark fuscous, tarsi wholly blackish, posterior tarsi irrorated with fuscous. Forewings elongate-oblong, costa moderately arched, apex obtuse, hindmargin straight, rather oblique, rounded beneath ; 7 to below apex ; light grey, closely irrorated with dark fuscous ; a slender transverse blackish streak near base, not reaching either margin ; two obscure dark fuscous dots transversely placed in disc at $\frac{1}{3}$; a short blackish transverse mark in disc at $\frac{2}{3}$; indistinct traces of an angulated darker transverse line beyond this ; four small dark fuscous spots on posterior half of costa : cilia whitish-grey, with two blackish-grey lines, first becoming interrupted into spots towards anal angle. Hindwings fuscous-grey, lighter towards base, apex darker ; cilia whitish-fuscous, with two faint darker lines.

Melbourne, Victoria ; one specimen received from Mr. G. H. Raynor.

10. Notosara, n. g.

Head with appressed hairs ; ocelli absent ; tongue well-developed. Antennæ moderate, in male —?, basal joint moderate, without pecten. Labial palpi very long, recurved, second joint dilated with dense scales roughly projecting beneath, terminal joint as long as second, slender, acute. Maxillary palpi very short, appressed to tongue. Thorax with strong posterior crest. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 very long-furcate towards base, 2 from angle, 7 and 8 stalked, 7 to apex, 11 from middle. Hindwings $1\frac{1}{4}$, ovate ; 1*b* and 1*c* densely haired towards base, 1*b* shortly furcate at base, 3 and 4 short-stalked, 5 parallel, 6 and 7 approximated towards base, 8 connected with cell at a point before middle.

A development of *Lichenaula*.

46. *Not. nephelotis*, n. sp.

Female 24-28mm. Head, palpi, and thorax whitish, irrorated with dark fuscous, thoracic crest and apex of patagia dark fuscous. Antennæ grey, sprinkled with whitish. Abdomen fuscous-whitish. Legs white, irrorated with dark fuscous, middle and posterior femora clear white, posterior tibiæ ochreous-white. Forewings elongate-oblong, costa moderately arched, apex rounded, hindmargin obliquely rounded ; brownish-grey, sprinkled with whitish ; veins marked with partially interrupted fine black lines ; an indistinct cloudy whitish suffusion forming an undefined

patch towards base, a spot in middle of disc followed by a roundish darker grey spot margined with black beneath, and an irregular outwards-curved fascia from $\frac{3}{4}$ of costa to inner margin before anal angle, indented towards near both extremities: cilia fuscous-grey. Hindwings fuscous, lighter towards base, hindmargin darker; cilia whitish-fuscous.

Perth, West Australia; three specimens in November.

11. Clerarcha, n. g.

Head with appressed hairs; ocelli absent; tongue developed. Antennæ moderate, in male serrate and dentate, moderately ciliated ted (1), basal joint moderate, without pecten. Labial palpi very long, recurved, second joint with appressed scales, slightly roughened beneath, terminal joint nearly as long as second, smooth, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 furcate towards base, 2 from $\frac{2}{3}$, 3 from angle, 7 and 8 stalked, 7 to apex, 11 from middle. Hindwings over 1, trapezoidal-ovate; towards inner margin and base of 1*b* clothed with long hairs, 1*b* shortly furcate at base, 3 and 4 from a point, 5 parallel, 6 and 7 stalked, 8 connected with cell at a point before middle.

1. Head grey, mixed with white. 2.
" ochreous-white. 49. *dryinopa.*
2. Forewings with black subcostal dash near base. 47. *grammatistis.*
" without " " " 48. *agana.*

47. *Cler. grammatistis*, n. sp.

Male 21-26 mm. Head, palpi, and thorax grey, mixed with white. Antennæ whitish. Abdomen grey-whitish. Legs white, irrorated with grey. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin nearly straight, oblique; ochreous-grey, irregularly and suffusedly irrorated with white; a black longitudinal dash beneath costa near base; a small white spot in disc at $\frac{2}{5}$, followed and often preceded by small suffused spots of black scales, and a small blackish suffused spot on fold rather obliquely before this; a small transverse whitish spot in disc at $\frac{2}{3}$, posteriorly suffusedly margined with black, and followed by some scattered black scales; an indistinct cloudy whitish line from costa beyond middle very obliquely outwards to near apex, thence sharply angulated, and continued to anal angle: cilia white, with two faint grey lines, basal half barred with dark grey. Hindwings pale whitish-fuscous; cilia white.

Perth and Albany, West Australia, in September and October; four specimens.

48. *Cler. agana*, n. sp.

Both sexes 15-18 mm. Head and thorax white, densely irrorated with ochreous-grey. Palpi white, second joint dark ochreous-grey, except at base and apex ; terminal joint grey on anterior edge. Antennæ whitish. Abdomen grey-whitish. Legs grey, posterior pair whitish. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded ; white, irrorated with dark ochreous-grey, dorsal half suffused with pale grey ; four small roundish cloudy rather dark grey spots, first three arranged in a longitudinal row in disc at $\frac{1}{3}$, $\frac{1}{2}$, and $\frac{2}{3}$, fourth directly beneath third : cilia whitish, base sprinkled with dark grey. Hindwings pale whitish-grey ; cilia ochreous-whitish.

Mount Lofty, South Australia ; Geraldton and Perth, West Australia, from October to January, and in April ; six specimens. Larva feeding in seed-cones of *Banksia marginata*, forming a mat of the soft down, which is spread along the branch, several larvæ living together. For this information I am indebted to Mr. E. Guest, who has bred the species.

49. *Cler. dryinopa*, n. sp.

Female 24 mm. Head, palpi, antennæ, thorax, and abdomen ochreous-white, partially tinged with brownish-ochreous ; abdominal segments with obscure narrow median transverse reddish bars. Legs whitish, suffused with light ochreous. Forewings elongate, costa moderately arched, apex obtuse, hindmargin nearly straight, rather oblique ; white, irregularly irrorated with light ochreous ; markings light brownish-ochreous, irregularly irrorated with dark fuscous ; a moderate cloudy streak from base beneath costa to apex ; a rather broad streak along inner margin from near base to anal angle, confluent with a small spot on submedian fold before middle ; an irregular cloudy transverse streak from before $\frac{2}{3}$ of costa to anal angle ; a broader cloudy transverse streak, angulated outwards above middle, from $\frac{3}{4}$ of costa to anal angle, where it coalesces with preceding ; a cloudy streak round apex and along hindmargin : cilia pale ochreous, irrorated with fuscous, and indistinctly barred with whitish. Hindwings fuscous-whitish, terminal third suffused with fuscous, darker posteriorly ; cilia fuscous-whitish, on upper half of hindmargin indistinctly barred with fuscous.

Melbourne, Victoria ; one specimen received from Mr. G. H. Raynor.

12. Plectophila, n. g.

Head loosely haired ; ocelli absent ; tongue developed. Antennæ moderate, in male serrate, shortly ciliated ($\frac{1}{4}$-$\frac{1}{2}$), basal joint moderate, without pecten. Labial palpi long, recurved,

second joint with appressed scales, slightly roughened beneath, terminal joint shorter than second, with appressed scales, acute. Maxillary palpi very short. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 furcate towards base, 2 from $\frac{2}{3}$, 3 from angle, 7 and 8 stalked, 7 to apex, 11 from middle. Hindwings 1, oblong-ovate; base below median and inner margin clothed with long hairs, 1*b* shortly furcate at base, 3 and 4 from a point, 5 tolerably parallel, 6 and 7 from a point, 8 connected with cell at a point towards base.

Forewings with an ochreous-brown fascia near base. 50. *electella*.
" without " " " " 51. *discalis*.

50. *Plect. electella*, Walk.

(*Oecophora electella*, Walk., 679.)

Both sexes 15-16 mm. Head white. Palpi white, second joint dark ochreous-brown towards base. Antennæ fuscous. Thorax white, with a horseshoe-shaped bright ochreous mark on middle of back. Abdomen whitish-ochreous. Legs ochreous-yellowish, anterior pair white above, dark fuscous beneath, hairs of posterior tibiæ ochreous-whitish. Forewings suboblong, costa moderately arched, apex roundpointed, hindmargin nearly straight, oblique; silvery-white; markings bright deep ochreous-brown, partially margined with light ochreous-yellowish scales; a straight narrow fascia from base of costa to $\frac{1}{4}$ of inner margin; a streak from upper extremity of this beneath costa, bent up to costa before middle, and continued along costa to $\frac{4}{5}$; a moderate irregular fascia from this streak before it reaches costa to inner margin at $\frac{3}{5}$, where it runs into a thick streak, attenuated at extremities, along inner margin from before middle to anal angle; a moderate fascia from costa at $\frac{3}{5}$ towards anal angle but not quite reaching it, connected with preceding fascia by a slender line in middle; a subapical spot, including a white dot on hindmargin, sometimes connected beneath with lower extremity of preceding fascia: cilia white, with dark grey bars at apex, middle, and anal angle, and basal half dark grey on lower half of hindmargin, with a cloudy black median line on dark grey portions. Hindwings grey, slightly ochreous-tinged; cilia whitish-grey-ochreous, with a cloudy grey basal line.

Sydney, New South Wales, from December to March; six specimens.

51. *Plect. discalis*, Walk.

(*Acontia discalis*, Walk. Suppl. 786.)

Both sexes 20-25 mm. Head, palpi, antennæ, thorax, abdomen, and legs white; anterior and middle legs infuscated. Forewings elongate-oblong, costa moderately arched, apex obtuse,

hindmargin sinuate, little oblique, rounded beneath; white; in female a light fuscous suffusion forming a cloudy fascia, its outer edge distinct and rectangularly angulated in middle, from $\frac{3}{5}$ of costa to inner margin before anal angle, and occupying entire dorsal $\frac{2}{3}$ of wing from base up to this, except a cloudy white spot below middle, sometimes irrorated with dark fuscous longitudinally in disc, and on posterior margin of fascia; in male these markings are largely reduced or nearly obsolete, showing only partial indications of the posterior fascia and a small spot on fold before middle; an irregular suffused fuscous streak along hindmargin, hindmarginal edge dark fuscous: cilia white, with two cloudy fuscous lines. Hindwings pale whitish-ochreous-grey, terminal half suffused with rather dark grey, extreme apex whitish-ochreous; cilia ochreous-whitish.

Sydney, New South Wales; in December and March, five specimens.

13. Tymbophora, n. g.

Head with appressed hairs; ocelli absent; tongue well-developed. Antennæ moderate, in male filiform, minutely ciliated ($\frac{1}{4}$), basal joint moderate, without pecten. Labial palpi very long, recurved, second joint with appressed scales, terminal joint almost as long as second, slender, acute. Maxillary palpi very short, appressed to tongue. Thorax with small posterior crest. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 furcate towards base, 2 from $\frac{2}{3}$, 3 from angle, 7 and 8 stalked, 7 to hindmargin, 11 from middle. Hindwings over 1, trapezoidal-ovate; towards inner margin and base of 1*b* clothed with long hairs, 1*b* shortly furcate at base, 3 and 4 short-stalked, 5 tolerably parallel, 6 and 7 from a point, 8 connected with cell at a point before middle.

This is a simple development of *Telecrates*, differing from it essentially only by the crested thorax.

52. *Tymb. peltastis*, n. sp.

Both sexes 19-27mm. Head ochreous-whitish. Palpi whitish, second joint ochreous-brownish, except at apex and towards base beneath. Antennæ whitish fuscous. Thorax very pale whitish-ochreous, more or less fuscous-tinged posteriorly, crest pale reddish-fuscous in front. Abdomen fuscous-whitish, segments with obscure narrow median transverse reddish bars. Legs ochreous-fuscous, femora white, posterior tibiæ whitish-ochreous. Forewings elongate, moderate, costa moderately arched, apex obtuse, hindmargin sinuate, hardly oblique; very pale whitish-ochreous, with fine scattered black or brownish scales, more or less tinged or suffused with pale fuscous except towards anterior half of costa, sometimes very faintly; a trapezoidal deep brown-red blotch,

irrorated with black and a few ochreous-whitish scales, extending on inner margin from $\frac{1}{3}$ to $\frac{3}{4}$, narrowed upwards, upper side flat, not reaching half across wing; three or four brownish dots on posterior half of costa: cilia whitish-ochreous, on costa barred with brown-red, on hindmargin with terminal half barred with brown-reddish, at anal angle with a brown-red basal spot irrorated with black. Hindwings fuscous-grey, more or less suffused with pale whitish-ochreous anteriorly; cilia ochreous whitish, with two cloudy pale fuscous lines.

Brisbane, Queensland; Sydney and Cooma (3,000 feet), New South Wales; Adelaide, South Australia; Fremantle, West Australia; in December and January, not uncommon. Larva 16-legged, stout, cylindrical, with scattered pale hairs; pale greyish-ochreous; spots moderate, dark fuscous; subdorsal strong, fuscous; sides irregularly marked with light pinkish; head irregularly spotted with dark ochreous-brown; second segment grey-whitish, with a suffused ochreous-brown transverse median band spotted with dark fuscous; anal segment speckled with black: feeds on *Angophora lanceolata*, residing in a chamber of silk beneath the bark, in October.

14. Xylorycta, n. g.

Head with loosely appressed hairs; ocelli absent; tongue well developed. Antennæ moderate, in male filiform or subserrate, strongly ciliated ($1\frac{1}{2}$-2), basal joint moderate, without pecten. Labial palpi long, recurved, second joint with appressed scales, terminal joint nearly as long as second, smooth, acute. Maxillary palpi very short. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 long-furcate towards base, 2 from $\frac{2}{3}$-$\frac{3}{4}$, 3 from angle, 7 and 8 stalked, 7 to hindmargin, 11 from middle. Hindwings over 1, oblong-ovate, towards base below median and towards inner margin densely clothed with long hairs, 1*b* shortly furcate at base, 3 and 4 from a point or short-stalked, 5 tolerably parallel, 6 and 7 from a point or short-stalked, 8 connected with cell at a point towards base.

This genus and the following are closely related, differing essentially only by the antennal ciliations; they are distinct enough at present, but might hereafter be united by the discovery of connecting forms. I think *Xylorycta* may be regarded as the immediate parent of *Cryptophaga*, which is distinguished from it mainly by the pectinated antennæ. The larval habits are similar.

In this and the three following genera great care must be taken not to confuse together the various unicolorous white species, and the structural differences must be accurately observed;

there are, moreover, other unicolorous white species of very similar appearance in the *Oecophoridæ* and *Gelechiadæ*, which might very easily be mixed with them, even by a skilled observer. The superficial resemblance of these various forms is very great, but I am unable to determine whether they imitate one another or a common model, or whether the very simple resultant may not have been produced independently by similar development under analogous circumstances, without direct imitation of anything; for instance, the end desired might have been conspicuousness.

1. Forewings with three ochreous-brown fasciæ. 53. *ophiogramma.*
" without fasciæ. 2.
2. Forewings with darker longitudinal discal streak. 3.
" without " " " " 4.
3. Forewings with dorsal half wholly light fuscous. 55. *strigata.*
" " " " not " " 54. *synaula.*
4. Forewings with tips of hindmarginal cilia orange. 59. *luteotactella.*
" " " " white. 5.
5. Sides of face orange. 57. *cosmopis.*
" " not orange. 6.
6. Sides of face fuscous. 58. *argentella.*
" " ochreous-white 56. *orectis.*

53. *Xyl. ophiogramma*, n. sp.

Female 24-28 mm. Head orange. Palpi pale yellowish, second joint dark fuscous externally on lower $\frac{2}{5}$, terminal joint whitish, anterior edge fuscous. Antennæ ochreous-whitish. Thorax silvery-white, with a transverse ochreous-brown bar behind collar. Abdomen whitish-ochreous. Legs dark fuscous, middle pair banded with ochreous-whitish, posterior pair pale yellowish. Forewings elongate-oblong, costa slightly arched, apex obtuse, hindmargin straight, little oblique ; silvery-white ; markings dark ochreous-brown ; a slender costal streak from base to $\frac{3}{4}$; three narrow irregular fasciæ, first very near base ; second from beyond middle of costa to before middle of inner margin, slightly sinuate inwards on lower half ; third from costa before apex to anal angle, rather angulated inwards in middle, lower extremity connected with middle of second fascia by an irregular bar : cilia whitish-ochreous, base more yellowish-ocherous. Hindwings whitish-ochreous, yellowish-tinged, towards apex suffused with light grey ; cilia as in forewings.

Duaringa, Queensland ; three specimens received from Mr. G. Barnard. Larva, according to Mr. Barnard, residing in a barri-

caded tunnel in stem of *Hakea lorea*, and carrying in the very long filiform leaves for food.

54. *Xyl. synaula*, n. sp.

Both sexes 26-30 mm. Head light ochreous-orange, face suffused with white. Palpi white, second joint suffused in male with blackish, in female with light ochreous-orange towards apex beneath, anterior edge of terminal joint dark fuscous. Antennæ grey. Thorax ochreous-brown, patagia except base, and a central stripe white. Abdomen whitish-ochreous. Legs rather dark fuscous, hairs of posterior tibiæ white. Forewings elongate, moderate, costa gently arched, apex roundpointed, hindmargin oblique, slightly rounded ; silvery-white ; costal edge very slenderly black towards base, yellowish-ochreous beyond middle ; markings ochreous-brown ; a moderate almost straight streak above middle from base to apex ; a similar slightly sinuate streak from base to anal angle ; a slender streak along inner margin from before middle to anal angle : cilia white, basal half at apex and towards anal angle ochreous-yellow. Hindwings light grey, more whitish-tinged towards base ; cilia ochreous-white, in female with a grey line.

Ardrossan and Victor Harbor, South Australia ; two specimens. Mr. E. Guest has bred this species from the larva, which feeds in long gallaries of silk and refuse among the twigs and thorns of a species of *Hakea*.

55. *Xyl. strigata*, Lw.

(*Cryptophasa strigata*, Lw., Ins. N.S. Wales.)

Both sexes 22-32 mm. Head and thorax light fuscous, patagia sometimes whitish towards base. Palpi and antennæ fuscous-whitish. Abdomen whitish, anal tuft whitish-ochreous. Legs whitish, anterior pair fuscous. Forewings elongate-oblong, costa gently arched, apex roundpointed, hindmargin nearly straight, oblique ; white ; dorsal half light fuscous ; a moderate straight darker fuscous streak above middle from base to apex : cilia white, round anal angle light fuscous, sometimes with a light fuscous subapical line. Hindwings whitish-fuscous, more whitish towards base, more or less suffused with darker fuscous towards apex ; cilia whitish.

Sydney, New South Wales ; Melbourne, Victoria ; in November and December, common. Larva 16-legged, stout, cylindrical, with scattered long whitish hairs ; whitish, posteriorly suffused with pale pinkish-ochreous ; segments 5-12, with a square of four transverse-elongate black spots on back, a large irregular black spot on side, enclosing a pale ocellus, a small black spot beneath this, and two others behind it, and an irregular square of four

round black spots below these, whole surface, except spots, broadly reticulated with pale carmine; fourth segment with a large double-triangular spot on back, third with a much larger one, each with four or five irregular spots on sides; second segment deep amber, each side with narrow black transverse stripe; head rugose, black; anal segment pale yellowish, shining. Feeds on *Banksia serrata* and other species of the genus, and on *Lambertia formosa*, residing in a barricaded tunnel in the branches, and carrying in leaves for food, in August and September.

56. *Xyl. orectis*, n. sp.

Male 34 mm. Head and thorax ochreous-white, crown more ochreous-tinged. Palpi, antennæ, and abdomen white. Legs light ochreous, posterior pair white. Forewings elongate, costa slightly arched, apex obtuse, hindmargin slightly rounded, rather strongly oblique; snow-white; extreme costal edge ochreous-tinged: cilia white. Hindwings pale grey, becoming white towards base; apex and upper part of hindmargin irregularly white; cilia white.

Perth, West Australia; in November, one specimen.

57. *Xyl. cosmopis*, n. sp.

Both sexes 22-24 mm. Head white, sides of face orange. Palpi white, second joint more or less orange-tinged. Antennæ whitish. Thorax silvery-white. Abdomen white, anal tuft ochreous-tinged. Legs ochreous-whitish, anterior and middle tibiæ more or less suffused with light orange. Forewings elongate, moderate, costa slightly arched, apex obtuse, hindmargin gently rounded, oblique; shining snow-white; costa slenderly ochreous-tinged, costal edge very slenderly blackish on basal fourth: cilia white. Hindwings grey-whitish, apex somewhat greyer; cilia white.

Geraldton, Perth, and Albany, West Australia; in November, four specimens.

58. *Xyl. argentella*, Walk.

(*Cryptolechia argentella*, Walk., 750.)

Both sexes 18-30 mm. Head pale yellowish-ochreous, sides of face light fuscous. Palpi white, second joint fuscous except on lower half beneath. Antennæ whitish. Thorax white, becoming whitish-ochreous anteriorly. Abdomen white, anal tuft ochreous-tinged. Legs dark fuscous, apex of joints whitish, posterior pair whitish-ochreous. Forewings elongate, moderate, costa gently arched, apex round-pointed, hindmargin straight, oblique; shining white, faintly ochreous-tinged, more distinctly on costal edge; costal edge very slenderly black on basal fourth: cilia ochreous-white. Hindwings light grey, becoming ochreous-whitish towards inner margin; cilia ochreous-whitish.

Sydney, New South Wales; Melbourne, Victoria; Deloraine and Hobart, Tasmania; from October to March, rather common.

59. *Xyl. luteotactella*, Walk.

(*Cryptolechia luteotactella*, Walk. 750; *C. cognatella*, ib. 751.)

Both sexes 17-26 mm. Head white, sides of face broadly orange. Palpi orange, terminal joint white. Antennæ ochreous-whitish, base orange. Thorax and abdomen white, anal tuft ochreous-tinged. Legs orange, posterior tibiæ white. Forewings elongate, moderate, costa slightly arched, apex obtuse, hindmargin straight, rather oblique; shining snow-white; costal edge narrowly orange, sometimes slenderly blackish towards base: cilia white, terminal third orange from below apex to above anal angle. Hindwings grey-whitish, posteriorly suffused with light grey; cilia white.

Sydney and Blackheath (3,500 feet), New South Wales; Melbourne, Victoria; in November, December, February, and March, common, especially in the larval state. Larva 16-legged, stout, cylindrical with scattered long hairs; whitish-grey, with subdorsal, spiracular, and subspiracular rows of large circular black spots, two on each segment; second segment ochreous-brown, with similar spots; head chestnut-brown, shining, forehead black: feeds on *Lambertia formosa*, *Hakea acicularis*, *Persoonia lanceolata*, *Banksia latifolia*, and probably many of the *Proteaceæ*, making firm broad galleries of silk and refuse amongst twigs, sometimes with a tunnel for retirement in the seed-vessels or midrib of leaves when suitable, gnawing the bark and leaves, in September, October, and December.

15. Telecrates, n. g.

Head with appressed hairs; ocelli absent; tongue well developed. Antennæ moderate, in male serrulate, very shortly ciliated ($\frac{1}{4}$-$\frac{1}{3}$), basal joint moderate, without pecten. Labial palpi very long, recurved, second joint smooth-scaled, terminal joint as long as second or nearly, or rarely only half as long, slender, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 furcate towards base, 2 from $\frac{1}{5}$, 3 from angle, 7 and 8 stalked, 7 to hindmargin, 11 from middle. Hindwings over 1, trapezoidal, densely haired towards base below middle, 1*b* shortly furcate at base, 3 and 4 from a point or short-stalked, 5 tolerably parallel, 6 and 7 from a point or stalked, 8 connected with cell at a point towards base.

1. Forewings white.		2.
"	not white.	6.
2. Forewings with dark streaks on all veins.		65. *calligramma*.
"	without dark streaks.	3.

3. Forewings with two dark grey dots in disc. 62. *bipunctella.*
" without darker dots. 4.
4. Forewings with two longitudinal yellow-ochreous stripes. 64. *parabolella.*
" without two longitudinal yellow-ochreous stripes. 5.
5. Terminal joint of palpi half second. 66. *micracma.*
" " " " as long as second. 63. *placidella.*
6. Forewings yellow. 61. *laetiorella.*
" fuscous. 60. *melanula.*

60. *Tel. melanula*, n. sp.

Both sexes 21-24mm. Head, antennæ, and thorax light ashy-fuscous, patagia dark fuscous. Palpi fuscous-whitish, irrorated with dark fuscous. Abdomen fuscous-whitish, segments with sharply-marked rather broad dull red median transverse bars. Legs whitish, irrorated with fuscous, anterior pair suffused with dark fuscous. Forewings elongate, moderate, costa moderately arched, apex obtuse, hindmargin straight, somewhat oblique; fuscous, lighter anteriorly, posteriorly slightly reddish-tinged; dorsal half suffused with ashy-grey, except an indistinct cloudy spot towards fold beyond middle; extreme costal edge whitish from $\frac{2}{5}$ to $\frac{4}{5}$; a thick dark fuscous streak beneath submedian fold from base to $\frac{1}{3}$; a whitish dot in disc at $\frac{2}{3}$: cilia fuscous. Hindwings with veins 6 and 7 from a point; fuscous-grey; cilia fuscous-whitish, with two faint cloudy darker lines.

Sydney, New South Wales, in December; two specimens received from Mr. G. H. Raynor.

61. *Tel. laetiorella*, Walk.

(*Oecophora laetiorella*, Walk. 677.)

Both sexes 16-23mm. Head black, face pale yellow. Palpi whitish-yellowish, base of second joint and terminal joint except base dark fuscous. Antennæ yellow-whitish, towards base dark fuscous. Thorax ochreous-yellow. Abdomen light ochreous yellowish, sprinkled with grey. Legs light ochreous-yellowish, anterior and middle pair suffusedly banded with grey. Forewings elongate-oblong, costa moderately arched, apex obtuse, hindmargin faintly sinuate, oblique; ochreous-yellow; two very broad deep purple fasciæ, obscurely margined with dark fuscous; first almost basal, outer edge slightly convex; second hindmarginal, anterior edge rather strongly convex: cilia ochreous-yellow, on costa purple-fuscous, at anal angle with a broad deep purple bar. Hindwings with veins 6 and 7 stalked; rather dark fuscous-grey; cilia pale ochreous-yellowish, above apex with a grey line near base.

Brisbane, Queensland; Newcastle and Sydney, New South Wales; Mount Lofty and Port Lincoln, South Australia; in September, October, January, and March, not uncommon. Larva residing in a barricaded tunnel in stems of *Eucalyptus*, carrying in leaves for food.

62. *Tel. bipunctella*, Walk.

(*Cryptolechia bipunctella*, Walk. 749.)

Male 24-25 mm. Head, thorax, and abdomen ochreous-white, sides of face fuscous. Palpi white, upper half of second joint dark fuscous. Antennæ whitish-fuscous. Legs dark fuscous, apex of joints whitish, posterior pair whitish. Forewings elongate-oblong, costa moderately arched, apex round-pointed, hindmargin faintly sinuate, oblique; ochreous-white, costa more ochreous-tinged; costal edge dark fuscous towards base; two moderate roundish dark-grey dots transversely placed in disc at $\frac{2}{3}$: cilia white. Hindwings with veins 6 and 7 from a point or short-stalked; ochreous-whitish, slightly greyish-tinged; cilia white.

Launceston, Tasmania; in December and January, three specimens.

63. *Tel. placidella*, Walk.

(*Cryptolechia placidella*, Walk. 750.)

Male 19-20 mm. Head white, sides of face broadly fuscous. Palpi white, upper half of second joint dark fuscous. Antennæ white, annulated with fuscous. Thorax white, anteriorly becoming whitish-ochreous. Abdomen ochreous-whitish. Legs ochreous-whitish, anterior and middle pair suffusedly banded with fuscous. Forewings elongate, costa moderately arched, apex roundpointed, hindmargin slightly sinuate, oblique; shining white; costal edge whitish-ochreous, extreme edge dark fuscous towards base: cilia whitish-ochreous, towards anal angle more yellowish-tinged. Hindwings with veins 6 and 7 from a point; pale whitish-ochreous, posterior half, except margin, suffused with light grey; cilia whitish-ochreous.

Sydney, New South Wales; in November, three specimens.

64. *Tel. parabolella*, Walk.

(*Oecophora parabolella*, Walk. 690.)

Both sexes 25-29 mm. Head ochreous-grey, sides of crown and lower part of face white. Palpi white, second joint brownish-ochreous except at apex and towards base, terminal joint dark fuscous anteriorly. Antennæ light grey. Thorax greyish-ochreous, becoming deep yellow-ochreous anteriorly. Abdomen whitish-ochreous. Legs ochreous-fuscous, posterior pair ochreous-whitish. Forewings elongate, moderate, costa moderately arched, apex obtuse, hindmargin straight, oblique; silvery-white; a

moderate deep yellow-ochreous longitudinal streak above middle from base to apex ; a broader similar stripe near inner margin from base throughout, touching inner margin at $\frac{1}{3}$, at extremity continued upwards more narrowly along hindmargin to meet upper streak at apex ; cilia whitish-ochreous, basal half white except at anal angle. Hindwings grey, extreme apex whitish-ochreous ; cilia whitish-ochreous.

Blackheath (3,500 feet), New South Wales ; Hobart, Tasmania ; Mount Lofty, South Australia ; from October to December, eight specimens. Larva feeds in the seed-cones of *Banksia marginata*.

65. *Tel. calligramma*, n. sp.

Both sexes 22-23 mm. Head fuscous, lower part of face and a mark above eyes white. Palpi dark fuscous, suffused with white above, and towards base of second joint on sides. Antennæ fuscous. Thorax fuscous, with a slender white stripe on each side of back. Abdomen fuscous-whitish. Legs dark fuscous, posterior pair fuscous-whitish. Forewings elongate, costa moderately arched, apex roundpointed, hindmargin nearly straight, oblique ; shining white ; all veins marked with rather thick bronzy-fuscous streaks : cilia fuscous-whitish, base bronzy-fuscous. Hindwings light grey, veins darker, apex suffused with whitish-ochreous ; cilia ochreous-whitish, with a faint fuscous basal line.

Blackheath (3,500 feet), New South Wales ; four specimens in November.

66. *Tel. micracma*, n. sp.

Male 17-18mm. Head white, with a suffused dark fuscous spot above each antenna. Palpi white, second joint irrorated with dark fuscous, towards apex wholly dark fuscous, terminal joint hardly half second. Antennæ dark grey. Thorax white, anteriorly ochreous-tinged. Abdomen grey-whitish. Legs dark grey, posterior pair grey-whitish. Forewings elongate, costa moderately arched, apex round pointed, hindmargin sinuate, oblique ; silvery-white ; costal edge finely dark fuscous towards base : cilia silvery-white, on costa light grey. Hindwings grey ; cilia white, base greyish-tinged.

Deloraine, Tasmania ; four specimens in December.

16. Chalarotona, n. g.

Head with appressed hairs ; ocelli absent ; tongue well-developed. Antennæ moderate, in male filiform, minutely ciliated ($\frac{1}{4}$-$\frac{1}{3}$), basal joint moderate, without pecten. Labial palpi very long, recurved, second joint smooth-scaled or slightly rough towards apex beneath, terminal joint from half to nearly as long as second, slender, acute. Maxillary palpi very short. Thorax

smooth. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 furcate towards base, 2 from $\frac{3}{4}$, 3 from angle, 7 and 8 stalked, 7 to apex, 11 from middle. Hindwings over 1, oblong-ovate; 1*b* and 1*c* densely haired towards base, 1*b* shortly furcate at base, 3 and 4 from a point or short-stalked, 5 tolerably parallel, 6 and 7 stalked, 8 connected with cell at a point towards base.

1. Forewings whitish. 2.
" ochreous-yellowish. 3.
2. Forewings with a fuscous streak along inner margin. 71. *craspedota.*
" without a fuscous streak along inner margin. 70. *insincera.*
3. Hindwings ochreous-whitish. 69. *melitoleuca.*
" grey. 4.
4. Second joint of palpi externally wholly dark fuscous. 68. *melipnoa.*
" " " dark grey on upper half only. 67. *intabescens.*

67. *Chal. intabescens*, n. sp.

Both sexes 16-23mm. Head ochreous-yellowish, sides of face somewhat infuscated. Palpi ochreous-whitish, second joint dark grey on upper half except at apex, terminal joint in male $\frac{3}{4}$, in female nearly 1, dark grey anteriorly, in male towards apex only. Antennæ light grey, often ochreous-whitish towards base. Thorax ochreous-yellow, generally more or less suffused with grey anteriorly. Abdomen whitish-ochreous, apex more yellowish. Legs dark grey mixed with ochreous-yellowish, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex obtuse, hindmargin oblique, slightly rounded; clear ochreous-yellowish; generally a cloudy-grey or dark grey dot above anal angle, sometimes obsolete: cilia pale ochreous-yellowish. Hindwings grey, darker posteriorly, cilia whitish-ochreous, more yellowish towards base, rarely somewhat greyish-tinged.

Sydney and Blackheath (3,500 feet), New South Wales, in September and November, not uncommon; appears to frequent *Banksia.*

68. *Chal. melipnoa*, n. sp.

Both sexes 16-21mm. Head and thorax ochreous-yellowish, sides of face fuscous. Palpi ochreous-whitish, second joint externally wholly rather dark fuscous, terminal joint $\frac{2}{3}$-$\frac{3}{4}$, dark fuscous anteriorly. Antennæ grey. Abdomen whitish-ochreous. Legs fuscous, posterior pair pale whitish-ochreous. Forewings elongate, costa moderately arched, apex roundpointed, hindmargin oblique,

slightly rounded; light yellowish-ochreous: cilia light yellowish-ochreous. Hindwings grey; cilia whitish-yellowish.

Blackheath (3,500 feet), New South Wales; Mount Lofty, South Australia; in October, six specimens. Closely allied to the preceding, but certainly distinct; probably also attached to *Banksia*.

69. *Chal. melitoleuca*, n. sp.

Both sexes 11-14 mm. Head and thorax ochreous-yellow. Palpi whitish, second joint with a grey subapical band, terminal joint $\frac{2}{3}$-$\frac{3}{4}$. Antennæ whitish. Abdomen ochreous-whitish. Legs ochreous-whitish, anterior pair suffused with grey. Forewings elongate, costa moderately arched, apex tolerably pointed, hindmargin slightly rounded, very oblique; rather deep ochreous-yellow: cilia ochreous-yellow, tips paler. Hindwings and cilia ochreous-whitish.

Sydney, New South Wales; two specimens in February.

70. *Chal. insincera*, n. sp.

Both sexes 16-21 mm. Head whitish-ochreous, sides of face dark fuscous. Palpi whitish, second joint rather dark fuscous except towards base, terminal joint in male $\frac{1}{2}$, in female $\frac{2}{3}$. Antennæ fuscous. Thorax whitish-ochreous, becoming white posteriorly. Abdomen ochreous-whitish. Legs dark grey, posterior pair ochreous-whitish. Forewings elongate, costa moderately arched, apex roundpointed, hindmargin nearly straight, oblique; shining ochreous-white: cilia ochreous-white. Hindwings light grey, apex tinged with whitish-ochreous; cilia ochreous-whitish, base more ochreous-tinged.

Deloraine and Hobart, Tasmania; in November and December, four specimens.

71. *Chal. craspedota*, n. sp.

Both sexes 17-19 mm. Head white, sides of face dark fuscous. Palpi white, second joint dark fuscous except towards base, terminal joint $\frac{1}{2}$-$\frac{2}{3}$, anterior edge dark fuscous. Antennæ fuscous. Thorax pale whitish-ochreous. Abdomen ochreous-whitish. Legs dark fuscous, posterior pair whitish. Forewings elongate, costa moderately arched, apex roundpointed, hindmargin slightly sinuate, very oblique; silvery-white, towards apex slightly fuscous-tinged; a narrow fuscous or rather dark fuscous streak along inner margin from near base to anal angle, upper edge suffused and ochreous-tinged: cilia ochreous-whitish. Hindwings ochreous-grey-whitish; towards apex more ochreous-tinged; cilia ochreous-whitish.

Blackheath (3,500 feet), New South Wales; Adelaide, South Australia; in March, four specimens.

17. Scieropepla, Meyr.

Head smooth ; ocelli absent ; tongue well developed. Antennæ moderate, in male serrate, moderately ciliated ($\frac{1}{2}$-1), basal joint moderate, without pecten. Labial palpi moderately long, recurved, second joint smooth-scaled, somewhat thickened terminally, terminal joint shorter than second ($\frac{1}{2}$ to nearly 1), acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ densely roughhaired above. Forewings with vein 1 furcate towards base, 2 from $\frac{1}{3}$, 7 and 8 stalked, 7 to costa, 11 from middle. Hindwings 1 or somewhat over, trapezoidal, apex roundpointed, 1*b* densely haired towards base, shortly furcate at base, 3 and 4 short-stalked, 5 tolerably parallel, 6 and 7 stalked, 8 connected with cell by bar before or beyond middle, cell sometimes bent up on bar.

1.	Forewings with apex very acutely produced.	80. *oxyptera.*
	" " " not " "	2.
2.	Forewings white.	3.
	" ochreous or grey.	4.
3.	Antennæ and sides of face fuscous.	72. *polyxesta.*
	" " " white.	73. *reversella.*
4.	Hindwings whitish-ochreous.	76. *typhicola.*
	" greyish.	5.
5.	Forewings with costa suffused with white.	6.
	" " " not " " "	8.
6.	Forewings with a dark fuscous dot in disc at $\frac{2}{3}$.	77. *rimata.*
	" without " " " "	7.
7.	Antennæ dark grey.	75. *liophanes.*
	" whitish.	74. *acrates.*
8.	Forewings densely irrorated with white.	78. *silvicola.*
	" not " "	79. *serina.*

72. *Scier. polyxesta*, n. sp.

Both sexes 14-21 mm. Head white, sides of face dark fuscous. Palpi white, second joint dark fuscous except towards base, terminal joint $\frac{1}{2}$. Antennæ fuscous. Thorax very pale whitish-ochreous. Abdomen ochreous-whitish. Legs dark fuscous, posterior pair ochreous-whitish. Forewings elongate, costa moderately arched, apex pointed, hindmargin very obliquely rounded ; shining ochreous-white, apex and inner margin more ochreous-tinged : cilia ochreous-white. Hindwings rather light grey, apex somewhat ochreous-tinged ; cilia pale whitish-ochreous.

Bathurst (2,500 feet) and Blackheath (3,500 feet), New South Wales ; Deloraine and Launceston, Tasmania ; in January and March, eight specimens.

73. *Scier. reversella*, Walk.

(*Cryptolechia reversella*, Walk. 752; *C. abrosella*, *ib.* 752.)

Both sexes 15-20 mm. Head, antennæ, thorax, and abdomen white. Palpi white, second joint with an ochreous subapical band irrorated with dark fuscous in front, terminal joint $\frac{2}{3}$. Legs whitish-ochreous, posterior pair white. Forewings elongate, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded; snow-white: cilia white. Hindwings whitish-grey, apex slightly ochreous-tinged; cilia white.

Sydney, New South Wales; Perth, West Australia; in October, November, January, February, June, and July, common.

74. *Scier. acrates*, n. sp.

Both sexes 14-17 mm. Head and thorax light ochreous-grey. Palpi white, second joint with upper half ochreous-grey except at apex, terminal joint $\frac{2}{3}$. Antennæ, abdomen, and legs whitish, anterior legs grey. Forewings elongate, costa gently arched, apex round-pointed, hindmargin faintly sinuate, very oblique; pale ochreous-greyish; costa suffused with whitish from base to $\frac{2}{3}$: cilia whitish. Hindwings light grey or whitish-grey, apical edge whitish-ochreous; cilia white, sometimes ochreous-tinged.

Blackheath (3,500 feet) and Mittagong (3,000 feet), New South Wales; Geraldton and Albany, West Australia; in October, March, and April, not uncommon. Larva feeds in the seed-cones of *Banksia collina*, burrowing among the seeds.

75. *Scier. liophanes*, n. sp.

Both sexes 14-15 mm. Head and thorax ochreous-grey, speckled with white. Palpi white, second joint with upper half dark grey except at apex, terminal joint $\frac{2}{3}$, anterior edge grey. Forewings elongate, costa gently arched, apex pointed, hindmargin extremely obliquely rounded; glossy ochreous-grey; costa narrowly suffused with white from base to $\frac{3}{4}$: cilia grey-whitish, base greyer. Hindwings light grey; cilia grey-whitish.

York, West Australia; in October, five specimens.

76. *Scier. typhicola*, Meyr.

(*Scieropepla typhicola*, Meyr., Trans. N.Z. Inst. 1885, 165.)

Both sexes 15-19 mm. Head and thorax light brownish-ochreous, face ochreous-whitish. Palpi ochreous-white, second joint fuscous except at apex and towards base, terminal joint $\frac{2}{3}$, anterior edge fuscous. Antennæ whitish-ochreous. Abdomen ochreous-whitish. Anterior legs dark brown, middle legs ochreous-brownish, posterior legs ochreous-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded; light ochreous, irrorated with dark

fuscous; costa suffused with pale whitish-ochreous from base to $\frac{3}{4}$: cilia pale whitish-ochreous. Hindwings whitish-ochreous, paler anteriorly; cilia pale whitish-ochreous.

Sydney, New South Wales; bred commonly from June to August; occurs also in New Zealand. Larva 16-legged, stout, cylindrical; whitish, sometimes pinkish-tinged; dorsal slender, dark flesh-colour; subdorsal and spiracular lines broader, indistinct, flesh-colour; head pale amber, mouth fuscous; second segment with a faint pale amber shield, black-margined on sides; anal segment speckled with black. Feeds in seed-heads of *Typha angustifolia*, burrowing amongst seeds and causing the down to hang in large loose masses, or sometimes boring down the stems, eating the pith and making many small holes in sides, in June. As this insect is quite isolated in New Zealand, whilst it is closely allied to the preceding and following species which are confined to Australia, it is safe to infer that it is truly an indigenous Australian insect, and has incidentally succeeded in making its way to New Zealand. I conjecture that the eggs, attached to the light down of the plant, would be very readily transmissible by the wind; and I have pointed out elsewhere that the wide distribution of *Limnœcia phragmitella*, a species of *Elachistidæ* which occurs in Australia, New Zealand, and Europe, and of which the larva feeds also on *Typha* in precisely the same way, is confirmatory of this suggestion.

77. *Scier. rimata*, n. sp.

Both sexes 15-17 mm. Head in male whitish, in female tinged with ochreous-greyish. Palpi white, second joint grey except at apex and towards base, terminal joint $\frac{2}{3}$-$\frac{3}{4}$, anterior edge grey. Antennæ in male whitish, in female grey. Thorax pale greyish-ochreous. Abdomen grey-whitish. Legs grey, posterior pair whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded; rather light greyish-ochreous, in male more or less suffusedly irrorated with white, especially in disc, in female irrorated with fuscous; costa suffused with white from base to $\frac{3}{4}$; a distinct dark fuscous dot in disc at $\frac{2}{3}$; cilia whitish-ochreous, on costa whitish. Hindwings light grey, apical margin whitish-ochreous; cilia whitish-ochreous.

Sydney and Bathurst (2,500 feet), New South Wales; Campbelltown and Georges Bay, Tasmania; Port Lincoln, South Australia; common from November to January, and in March.

78. *Scier. silvicola*, n. sp.

Both sexes 12-14 mm. Head white, more or less sprinkled with grey. Palpi blackish, apex of second joint white, terminal

joint $\frac{2}{3}$, white, anterior edge dark fuscous. Antennæ dark grey. Thorax whitish, irrorated with grey, beneath in male with a long slender expansible hairpencil on each side in front. Abdomen grey-whitish. Legs dark fuscous, posterior pair grey-whitish. Forewings elongate, costa gently arched, apex pointed, hindmargin extremely obliquely rounded; fuscous-grey, sprinkled with darker, and densely irrorated with white, especially in disc, where it tends to form a longitudinal suffusion; costa suffusedly rather darker; a dark fuscous dot in disc before middle, a second on fold obliquely before first, and a third in disc at $\frac{2}{3}$: cilia pale grey. Hindwings grey; cilia pale grey.

Sydney, New South Wales; common in February and March.

79. *Scier. serina*, n. sp.

Male 20 mm. Head, palpi, antennæ, thorax, and legs dark grey; face and posterior legs grey-whitish; terminal joint of palpi almost 1. Forewings elongate, costa gently arched, apex roundpointed, hindmargin extremely obliquely rounded; dark grey; some blackish scales, tending to form an ill-defined dot in disc at $\frac{2}{5}$, a second on fold obliquely beyond it, and a third in disc at $\frac{2}{3}$: cilia dark grey. Hindwings grey, becoming darker towards hindmargin; cilia grey.

Bathurst (2,500 feet), New South Wales; in March, one specimen.

80. *Scier. oxyptera*, n. sp.

Both sexes 12-18 mm. Head whitish, sometimes partially greyish or ochreous-tinged. Palpi white, generally more or less grey anteriorly, terminal joint $\frac{1}{2}$-$\frac{2}{3}$. Antennæ grey. Thorax ochreous-whitish. Abdomen whitish. Legs dark fuscous, posterior pair whitish. Forewings elongate, narrow, costa gently arched, apex very acute, produced, hindmargin siuuate, extremely oblique; fuscous-grey, darker on costal half, in male more ochreous-tinged, dorsal third in male paler and whitish tinged throughout; a moderate snow-white streak along costa from base to near apex, leaving costal edge fuscous from near base to $\frac{3}{4}$: cilia pale whitish-fuscous, white on costa above apex of streak. Hindwings grey or grey-whitish; cilia pale grey or whitish, in male pale greyish-ochreous.

Sydney, New South Wales; Mount Lofty, South Australia; Albany, West Australia; in October and December, five specimens. My materials for this species are somewhat discordant, and I may have possibly confused more than one; they comprise three small dark females with grey hindwings from Sydney, one large female with whitish hindwings from Albany, and one more ochreous-tinged male from Mount Lofty; further discoveries will

show whether these are anything more than slight geographical forms. I regard the first-mentioned form as the type.

18. Procometis, n. g.

Head smooth; ocelli absent; tongue developed. Antennæ moderate, in male filiform or serrate, simple, basal joint moderately elongate, without pecten. Labial palpi very long, recurved, second joint with appressed scales, terminal joint almost as long as second, slender, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above. Forewings with vein 1 furcate towards base, 2 from $\frac{2}{3}$, 3 from angle, 7 and 8 stalked, 8 to costa or apex, 11 from middle. Hindwings over 1, trapezoidal, apex roundpointed, costa in male clothed with very long hairs on basal half lying beneath forewings, 1*b* densely haired towards base, shortly furcate at base, 3 and 4 from a point or short-stalked, 5 parallel, 6 and 7 from a point or short-stalked, 8 connected with cell at a point towards base.

1. Forewings with apex acute. 2.
   " " " obtuse. 5.
2. Forewings with costa whitish-yellowish. 83. *lipara*.
   " " " white. 3.
3. Forewings with costal white streak suffused. 84. *hylonoma*.
   " " " " " sharply defined. 4.
4. Forewings with central white streak as broad as costal. 81. *bisulcata*.
   " " " " " much slenderer than costal. 82. *monocalama*.
5. Hindwings yellow ochreous. 85. *genialis*.
   " fuscous-grey. 86. *diplocentra*.

81. *Proc. bisulcata*, n. sp.

Both sexes 17-20mm. Head ochreous-brownish. Palpi ochreous-fuscous, base whitish. Antennæ dark fuscous. Thorax ochreous-fuscous. Abdomen ochreous-whitish. Legs fuscous, posterior pair ochreous-whitish. Forewings elongate, costa gently arched, apex acute, hindmargin faintly sinuate, extremely oblique; ochreous-fuscous or brownish-ochreous; a silvery-white streak along costa from base almost to apex; a straight central longitudinal silvery-white streak from base to hindmargin beneath apex, more or less suffused on lower edge, sometimes tending to become obsolete posteriorly: cilia whitish-ochreous. Hindwings in male whitish-ochreous, posteriorly fuscous-tinged, in female fuscous, paler towards base; costal hairs of male whitish-ochreous, forming a dense pencil lying along upper surface on costa; cilia whitish-grey-ochreous.

Sydney, New South Wales, in January and February; four specimens.

82. *Proc. monocalama*, n. sp.

Female 18mm. Head light grey, with a few white scales. Palpi dark grey, basal half and extreme apex of second joint white. Antennæ dark fuscous. Thorax fuscous. Abdomen pale grey. Legs dark fuscous, posterior tibiæ fuscous-whitish. Forewings elongate, costa gently arched, apex acute, hindmargin sinuate, extremely oblique; ochreous-fuscous, irrorated with whitish; a snow-white streak along costa from base to near apex, bordered beneath by a broader rather dark ochreous-fuscous streak without white irroration, extending from base to apex; a short white longitudinal dash on lower margin of the dark streak about middle or obscurely continued to base: cilia pale ochreous-greyish, with some white scales. Hindwings rather light fuscous; cilia whitish-fuscous.

Sydney, New South Wales, in February; one specimen.

83. *Proc. lipara*, n. sp.

Both sexes 17-22 mm. Head pale ochreous-yellowish, crown sometimes deeper yellow. Palpi fuscous, second joint somewhat sprinkled with pale yellowish. Antennæ dark fuscous. Thorax dark fuscous, patagia pale ochreous-yellowish except at base. Abdomen grey. Legs dark fuscous, posterior tibiæ whitish-yellowish. Forewings elongate, costa moderately arched, apex acute, hindmargin sinuate, very oblique; rather dark fuscous; a pale ochreous-yellowish or whitish ochreous rather irregular suffused streak along costa from base to apex, leaving costal edge dark fuscous on anterior half; a similar median streak from base to $\frac{2}{3}$, sometimes dilated so as to coalesce more or less entirely with costal; some whitish-ochreous scales towards hindmargin beneath apex, sometimes forming a small suffusion, or increased so as to coalesce with apex of median streak: cilia fuscous, on costa whitish-yellowish. Hindwings rather dark fuscous-grey; cilia fuscous, with a darker subbasal line.

Sydney, Blackheath (3,500 feet), and Bathurst (2,500 feet), New South Wales; from January to March, common.

84. *Proc. hylonoma*, n. sp.

Both sexes 18-25 mm. Head whitish-ochreous. Palpi white, irrorated with ochreous-fuscous on upper half of second joint, and on terminal joint anteriorly. Antennæ whitish, annulated with dark fuscous. Thorax whitish-ochreous, sprinkled with fuscous. Abdomen whitish-ochreous. Legs ochreous-whitish, anterior pair fuscous. Forewings elongate, costa moderately arched, apex pointed, hindmargin almost straight, very oblique; white, more

or less irrorated irregularly with ochreous-fuscous, sometimes suffused with whitish-ochreous on dorsal half; a fuscous dot on fold beneath middle, and another in disc at $\frac{2}{3}$, sometimes very indistinct: cilia pale ochreous, sprinkled with whitish. Hindwings light fuscous, darker towards hindmargin, paler and more whitish-ochreous towards base; cilia whitish-ochreous, with a light fuscous line.

Sydney and Bathurst (2,500 feet), New South Wales; Kangaroo Island, South Australia; in December and January, common.

85. *Proc. genialis*, n. sp.

Male 19-20 mm. Head, palpi, antennæ, thorax, and legs fuscous-whitish, densely irrorated with blackish; posterior legs pale yellowish. Abdomen light ochreous-yellowish. Forewings elongate, costa moderately arched, apex obtuse, hindmargin very obliquely rounded; ashy-white, densely irrorated with blackish; markings obscure, fuscous, irrorated with black; a short longitudinal dash in disc about middle; a longitudinal streak above inner margin from from $\frac{1}{3}$ to anal angle, interrupted in middle of wing, and a less marked streak along inner margin and hindmargin from base to apex; a small cloudy roundish ochreous spot in disc at $\frac{4}{5}$: cilia whitish, irrorated and indistinctly barred with dark fuscous. Hindwings yellow-ochreous, somewhat fuscous-tinged, especially posteriorly; cilia whitish-ochreous, with an ochreous basal line.

Sydney, New South Wales; in November, two specimens.

86. *Proc. diplocentra*, n. sp.

Male 19-20 mm. Head, palpi, antennæ, thorax, and legs whitish, irrorated with blackish-grey; posterior tibiæ whitish. Abdomen grey-whitish, base of segments grey, sides of two or three basal segments with some orange scales. Forewings elongated, costa slightly arched, apex obtuse, hindmargin very obliquely rounded; ashy-whitish, densely irrorated with dark fuscous, and with scattered black scales; two cruciform small dark fuscous spots, transversely placed and confluent, in disc before middle, and a third, somewhat larger, in disc at $\frac{2}{3}$; a series of short obscure darker marks before hindmargin: cilia whitish, mixed with grey, and with a grey subapical line, basal third white more or less distinctly barred with dark fuscous. Hindwings fuscous-grey; cilia whitish-fuscous, with a well-marked fuscous line near base.

Duaringa, Queensland; two specimens received from Mr. G. Barnard.

19. Hypertricha, n. g.

Head smooth; ocelli absent; tongue developed. Antennæ moderate, in male filiform, simple, basal joint moderate, without pecten. Labial palpi moderately long, curved, ascending, second joint with rough scales beneath projecting towards apex, terminal joint very short, $\frac{1}{4}$ of second, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above. Forewings with vein 1 furcate towards base, 2 from $\frac{2}{3}$, 3 from angle, 7 absent (coincident with 8), 11 from middle. Hindwings $1\frac{1}{4}$, subtriangular, apex rounded, costa in male with extremely long hairs from basal half lying beneath forewings, 1*b* densely haired towards base, shortly furcate at base, 3 and 4 short-stalked, 5 parallel, 6 and 7 from a point, 8 connected with cell at a point towards base.

87. *Hyp. ephelota*, n. sp.

Male 24 mm. Head and thorax light fuscous, mixed with ochreous-whitish. Palpi fuscous irrorated with white, lower half of second joint white. Antennæ fuscous. Abdomen brownish-ochreous, basal half light grey with three incomplete dull reddish bands. Legs dark fuscous, apex of joints ochreous-whitish, posterior pair ochreous-whitish. Forewings elongate, costa strongly arched, apex round-pointed, hindmargin extremely obliquely rounded; fuscous, irregularly strewn with ashy-whitish scales; an ill-defined dot of dark fuscous scales on submedian fold at $\frac{1}{4}$, a second in middle of disc, a third on fold beneath second, a fourth in disc at $\frac{3}{4}$, and traces of a fifth on fold towards anal angle; second and fourth connected by an ashy-whitish streak, and a less marked similar streak connecting the other three; some dark fuscous scales on veins posteriorly: cilia fuscous mixed with whitish. Hindwings fuscous; costal hairs bright ochreous towards base; cilia pale fuscous, with a darker basal line.

Mount Lofty, South Australia; one specimen.

20. Phylomictis, n. g.

Head with appressed hairs; ocelli absent; tongue well-developed. Antennæ moderate, in male shortly ciliated ($\frac{1}{3}$), basal joint short, without pecten. Labial palpi moderate, curved, ascending, smooth-scaled, terminal joint much shorter than second, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 furcate towards base, 2 from near angle, 3 and 4 stalked, 7 and 8 stalked, 7 to apex, 11 from middle. Hindwings $1\frac{1}{4}$, oblong-ovate, towards base below median and towards inner margin clothed with long hairs,

1*b* shortly furcate at base, 3 and 4 moderately stalked, 5 approximated to 4 at base, 6 and 7 stalked, upper margin of cell bent up before angle, connected with 8 by bar on bend.

This genus is valuable genetically as showing without doubt the connection between the following genus and the rest of the family; without it, *Agriophara* would stand very isolated. If *Agriophara* is regarded as the terminal of an offset from the main stem, then *Phylomictis* is a remnant of the lower portion of the same offset.

88. *Phyl. maligna*, n. sp.

Male 23 mm. Head ochreous-whitish, mixed with grey on crown. Palpi whitish, irregularly sprinkled with dark grey. Antennæ whitish, annulated with dark grey. Thorax dark grey, towards posterior extremity grey-whitish. Abdomen dark grey, sides and apex ochreous-whitish. Legs dark grey. Apex of joints and posterior tibiæ ochreous-whitish. Forewings elongate, costa gently arched, apex obtuse, hindmargin very obliquely rounded; white, slightly ochreous-tinged; a thick irregular dark grey streak along inner margin from base to anal angle; an irregular much interrupted dark fuscous transverse line from $\frac{1}{3}$ of costa to dorsal streak beyond middle; a dark fuscous dot in disc at $\frac{2}{3}$; apical $\frac{2}{5}$ of wing wholly fuscous, sprinkled with darker fuscous, and with curved subterminal and hindmarginal series of obscure whitish marks: cilia whitish, basal half barred with fuscous. Hindwings fuscous, darker towards hindmargin; cilia light fuscous, tips more whitish.

Melbourne, Victoria; one specimen received from Mr. G. H. Raynor.

21. Agriophara, Ros.

Head with appressed hairs; ocelli absent; tongue well-developed. Antennæ moderate, in male filiform, ciliated with long fascicles (3-4), basal joint moderate, without pecten. Labial palpi moderate, curved, ascending, second joint with appressed scales, somewhat rough beneath, terminal joint shorter than second, smooth, acute. Maxillary palpi very short, appressed to tongue. Thorax smooth. Abdomen moderate. Posterior tibiæ rough-haired above and beneath. Forewings with vein 1 furcate towards base, 2 from $\frac{5}{6}$ or near angle, 7 and 8 approximated at base, 7 to apex, 11 from middle. Hindwings $1\frac{1}{2}$, subovate, towards base below median and towards inner margin clothed with long hairs, 1*b* shortly furcate at base, 3 and 4 from a point or short-stalked, 5 approximated to 4 at base, 6 and 7 stalked, upper margin of cell bent up before angle so as nearly to touch 8, connected with it by bar on bend, with a short connecting furrow beneath bend.

A curious genus. The species are dull-coloured and often very similar, so that considerable care is required in separating them.

1. Forewings with brownish blotches. 89. *confertella.*
" without " " 2.
2. Forewings appearing blackish or dark fuscous. 3.
" " grey. 4.
3. Forewings with blackish streaks or spots. 93. *atratella.*
" without " " " 92. *capnodes.*
4. Forewings with a roundish darker spot in disc posteriorly. 90. *gravis.*
" without " " 5.
5. Forewings with a short oblique black streak from base of costa. 6.
Forewings without " " " 7.
6. Forewings with ill-defined longitudinal dark streak below middle. 95. *cinerosa.*
Forewings without " " 96. *axesta.*
7. Hindwings wholly ochreous-whitish. 91. *horridula.*
" more or less grey. 8.
8. Expanse of wings over 30 mm. 94. *cinderella.*
" " under 20 mm. 9.
9. Hindwings in male whitish anteriorly. 98. *fascifera.*
" " wholly grey. 97. *diminuta.*

89. *Agr. confertella*, Walk.

(*Cryptolechia confertella*, Walk. 758.)

Female 27 mm. Head, palpi, and thorax whitish, finely irrorated with dark fuscous; palpi with lower half of second joint dark fuscous. Antennæ grey. Abdomen light fuscous. Legs white, banded with dark fuscous irroration, tarsi dark fuscous with white rings at apex of joints. Forewings elongate-oblong, costa strongly arched, apex obtuse, hindmargin very obliquely rounded; whitish, partially tinged with pale grey, and finely irrorated throughout with blackish; a brown oblique fascia-like spot from costa about $\frac{1}{3}$, somewhat dilated downwards, reaching to below middle of disc, containing a blackish suffusion towards its lower extremity; a roundish brown blotch in disc about $\frac{3}{4}$, including a longitudinal suffused blackish streak, and confluent posteriorly with a smaller brown blotch on middle of hindmargin; a sinuate fuscous line from middle of costa to centre of blotch at $\frac{3}{4}$; an ill-defined blackish-fuscous denticulate line from $\frac{2}{3}$ of costa to inner margin before anal angle, very strongly curved outwards so as to approach margin throughout, followed on costa by two or three small spots of brownish suffusion: cilia whitish, barred with brownish and partially irrorated with black.

Hindwings fuscous, somewhat lighter anteriorly; cilia fuscous-whitish, with a fuscous line.

Sydney, New South Wales; in October, two specimens.

90. *Agr. gravis*, n. sp.

Both sexes 26-27 mm. Head, palpi, antennæ, and thorax white, densely irrorated with dark fuscous; palpi with lower half of second joint dark fuscous. Abdomen pale grey. Legs dark grey, apex of joints and posterior tibiæ whitish. Forewings elongate, costa rather strongly arched, apex rounded, hindmargin very obliquely rounded; fuscous-grey, densely irrorated with white; some short streaks of blackish scales on veins in disc and towards hindmargin, the latter forming a strongly curved transverse series; a blackish dot in disc before $\frac{2}{3}$; a dark fuscous suffused spot immediately beyond this, and a smaller one on middle of hindmargin, nearly confluent: cilia whitish, with rows of fuscous-grey points, and an interrupted blackish line near base. Hindwings fuscous-grey, lighter anteriorly; cilia grey-whitish, with two faint grey lines.

Sydney, New South Wales; Deloraine, Tasmania; from September to November, six specimens. Recognisable by the suffused dark fuscous posterior spot in disc, which, though ill-defined, is always sufficiently conspicuous.

91. *Agr. horridula*, n. sp.

Male 18 mm. Head and antennæ very pale greyish-ochreous. Palpi ochreous-grey-whitish, lower half of second joint fuscous. Thorax pale greyish-ochreous irrorated with grey, posterior margin ochreous-whitish. Abdomen pale whitish-ochreous. Legs ochreous-whitish, anterior pair fuscous, middle pair banded with fuscous. Forewings elongate, costa moderately arched, apex obtuse, hindmargin obliquely rounded; whitish-ochreous, densely irrorated with light fuscous and whitish; an oblique transverse bar of raised scales in disc at $\frac{2}{3}$, and a direct similar bar at $\frac{3}{4}$; an indistinct fuscous streak from costa at $\frac{1}{4}$ to apex of first bar, and another from middle of costa to apex of second; a short fuscous dash in disc beneath middle; a strongly curved series of small subconfluent fuscous spots from costa beyond middle to anal angle: cilia ochreous-whitish, basal half barred on hindmargin with very pale brownish, on costa with fuscous. Hindwings ochreous-whitish, posteriorly slightly fuscous-tinged: cilia whitish.

Sydney, New South Wales; one specimen in March. Very distinct by the ochreous-whitish general colouring; the raised scales in disc are also a well-marked characteristic, of which traces only are perceptible in other species.

92. *Agr. capnodes*, n. sp.

Both sexes 23-25 mm. Head, palpi, antennæ, and thorax dark

fuscous, slightly sprinkled with whitish-ochreous. Abdomen pale whitish-fuscous. Legs dark fuscous, posterior pair fuscous-whitish. Forewings elongate, costa in male gently, in female moderately arched, apex rounded, hindmargin very obliquely rounded; fuscous, densely irrorated with dark fuscous; a series of faint longitudinal dark marks before hindmargin: cilia fuscous, basal half irrorated with dark fuscous. Hindwings whitish-fuscous, towards apex somewhat darker; cilia whitish-fuscous, with a darker line, tips white.

Mount Lofty, South Australia; three specimens. Distinguished from all others by the apparently nearly uniform dark fuscous forewings.

93. *Agr. atratella*, Walk.

(*Acrobasis atratella*, Walk. Suppl. 1712.)

Male 15-19 mm. Head, palpi, antennæ, and thorax blackish-fuscous. Abdomen whitish-grey. Legs dark fuscous, apex of joints and posterior tibiæ grey-whitish. Forewings elongate, costa gently arched, apex rounded, hindmargin very obliquely rounded; dark fuscous, somewhat purple-shining, with a few scattered whitish-grey scales; disc irregularly mixed with black, tending to form short streaks on veins; a very minute, sometimes obsolete, whitish dot in disc at $\frac{2}{3}$; a series of indistinct blackish spots beneath costa from $\frac{1}{4}$ to near apex, thence curved round near hindmargin to anal angle: cilia dark fuscous, basal half irrorated with blackish, with obscure ill-defined grey-whitish bars. Hindwings light grey; cilia whitish-grey.

Newcastle and Blackheath (3,500 feet), New South Wales; from September to November, five specimens. Easily separated from the preceding by the blackish markings and smaller size.

94. *Agr. cinderella*, Newm.

(*Chimabacche cinderella*, Newm., Trans. Ent. Soc. Lond. (N.S.) III., 288.)

Both sexes 35 mm. Head, palpi, antennæ, and thorax ashy-grey. Forewings ashy-grey, irrorated with black; disc with several short black streaks; a curved series of lunate blackish spots near hindmargin; a hindmarginal row of black dots. Hindwings paler grey.

Melbourne, Victoria. The above description is taken from Newman; I have seen specimens of this species, but do not possess it, and omitted to take any description from them; it is immediately recognisable by its large size.

95. *Agr. cinerosa*, Ros.

Agriophara cinerosa, Ros., Ann. Mag. Nat. Hist. 1885, 439.)

Both sexes 20-22 mm. Head, palpi, antennæ, and thorax whitish, densely irrorated with dark fuscous. Abdomen pale

whitish-fuscous. Legs dark fuscous, apex of joints whitish, middle tibiæ irrorated with ochreous-whitish, posterior tibiæ ochreous-whitish. Forewings elongate, rather narrow, costa gently arched, apex rounded, hindmargin very obliquely rounded; fuscous, densely irregularly irrorated with white and black; an indistinct blackish short very oblique streak from base of costa; two very obscure oblique darker streaks from costa at $\frac{1}{3}$ and middle; a very obscure ill-defined darker longitudinal streak in disc below middle from base to hindmargin, finely attenuated anteriorly, obscurely interrupted at $\frac{2}{3}$; above interruption an obscure white dot, followed by black scales: cilia white, with rows of grey points towards tips, basal half irrorated with blackish, forming obscure bars. Hindwings light fuscous-grey, darker towards apex; cilia fuscous-whitish, with a fuscous line.

Sydney, New South Wales; Wirrabara, South Australia; in October, five specimens. Narrower-winged than the two following species, specially characterised by the dark submedian streak.

96. *Agr. axesta*, n. sp.

Both sexes 19-21 mm. Head, palpi, and thorax dark grey, more or less irrorated with whitish. Antennæ grey. Abdomen pale whitish-fuscous. Legs dark fuscous, apex of joints and posterior tibiæ whitish, middle tibiæ irrorated with whitish. Forewings elongate, moderate, costa moderately arched, apex rounded, hindmargin very obliquely rounded; fuscous-grey, irrorated with white; a short black attenuated very oblique streak from base of costa, margined beneath with white towards base; three transverse series of very obscure marks formed by a blackish irroration; first nearly straight, from $\frac{1}{4}$ of costa to submedian fold before middle; second from middle of costa very obliquely outwards to disc at $\frac{3}{4}$, where it is curved abruptly round and terminates in disc at $\frac{2}{3}$, with some irregular marks beneath it; third from $\frac{2}{3}$ of costa very obliquely outwards, near apex bent round and continued near hindmargin to anal angle: cilia whitish with rows of fuscous points, with a dark fuscous interrupted line near base. Hindwings fuscous-grey, lighter towards base; cilia fuscous-whitish, with a fuscous line.

Wirrabara, South Australia; in October, common. Very like the following, but somewhat larger, and readily distinguishable by the short black streak from base of costa; the markings also differ in detail when closely examined, and the species are unquestionably distinct.

97. *Agr. diminuta*, Ros.

(*Agriophara diminuta*, Ros., Ann. Mag. Nat. Hist., 1885, 440.)

Both sexes 16-18mm. Head, palpi, antennæ, and thorax grey, irrorated with whitish. Abdomen light grey. Legs dark fuscous,

apex of joints and posterior tibiæ whitish, middle tibiæ irrorated with whitish. Forewings elongate, costa gently arched, apex rounded, hindmargin nearly straight, very oblique; fuscous-grey, irrorated with whitish; a short blackish dash beneath costa near base, and another on submedian fold at $\frac{1}{3}$; three transverse series of obscure marks formed by a blackish irroration; first straight, from $\frac{1}{4}$ of costa to $\frac{3}{4}$ of inner margin; second from middle of costa very obliquely outwards to $\frac{3}{4}$ of disc, thence sharply angulated and continued to middle of inner margin, crossing first on fold; third from $\frac{3}{5}$ of costa very obliquely outwards to near apex, thence curved round near hindmargin to anal angle: cilia grey-whitish, basal half barred with fuscous. Hindwings grey, somewhat darker towards apex; cilia light grey.

Launceston, Tasmania; in January, common. The basal black streak appears here only as a very short dash which does not reach the costa, and the similar dash in disc anteriorly is also a characteristic mark.

98. *Agr. fascifera*, n. sp.

Both sexes 13-14mm. Head, palpi, antennæ, and thorax white, densely irrorated with dark fuscous. Abdomen fuscous-whitish. Legs dark grey, apex of joints and middle and posterior tibiæ whitish. Forewings elongate, rather narrow, costa slightly arched, apex rounded, hindmargin very obliquely rounded; white, finely irrorated with black and coarsely with fuscous, tending to form short longitudinal streaks; a faintly defined somewhat darker streak from middle of costa very obliquely outwards to $\frac{4}{5}$ of disc, thence acutely angulated and continued to middle of inner margin; a series of small dark longitudinal marks from $\frac{2}{3}$ of costa very obliquely outwards to near apex, thence curved round near hindmargin to anal angle: cilia whitish, basal half indistinctly barred with dark fuscous. Hindwings in male whitish, semitransparent, towards apex grey, in female grey, paler and thinly scaled anteriorly; cilia whitish-grey.

Sydney and Bathurst (2,500 feet), New South Wales, from September to November, and in March; five specimens. Readily distinguished by the small size, comparatively narrow forewings, and the whitish hindwings of male.

INDEX OF GENERA.

Agriophara, Ros.	21	Phthonerodes, n. g.	7
Catoryctis, n. g.	6	Phylomictis, n. g.	20
Chalarotona, n. g.	16	Pilostibes, n. g.	2
Clerarcha, n. g.	11	Plectophila, n. g.	12
Compsotorna, n. g.	5	Procometis, n. g.	18
Crypsicharis, n. g.	8	Scieropepla, Meyr.	17
Cryptophaga, Lw.	3	Telecrates, n. g.	15
Hypertricha, n. g.	19	Tymbophora, n. g.	13
Lichenaula, n. g.	9	Uzucha, Walk.	1
Maroga, Walk.	4	Xylorycta, n. g.	14
Notosara, n. g.	10		

INDEX OF SPECIES.

The numbers refer to those prefixed to each species in order. Names italicised are synonyms. Those without suffix are new.

abrosella, Walk. ... 73
acrates 74
agana 48
albicosta, Lw. 11
argentella, Walk. ... 58
arisema 38
atratella, Walk. ... 93
axesta 96
balteata, Walk. ... 23
bipunctella, Walk. ... 62
bisulcata 81
calligramma 65
calligrapha 39
capnodes 92
choriodes 42
cinderella, Newm. ... 94
cinerosa, Ros. 95
cognatella, Walk. ... 59
confertella, Walk. ... 89
cosmopis 57
craspedota 71
delocentra 25
diminuta, Ros. 97
diplocentra 86
discalis, Walk. 51
dolerastis 5
dryinopa... 49
ecclesiastis, Meyr. ... 10
electella, Walk. ... 50
enchidias 3
epadelpha 19
ephelota 87
epigramma 7
eugramma 31
fascifera 98
fissulella, Walk. ... 30
flavolineata, Walk. ... 18
genialis 85
gigantella, Walk. ... 26
grammatistis 47
gravis 90
hierastis 4
horridula 91
humeralis, Walk. ... 1
hylonoma 84
insincera... 70
intabescens 67
irrorata, Lw. 12
laetiorella, Walk. ... 61
laniata 37
leucadelpha, Meyr. ... 13
lichenea 40
liophanes 75
lipara 83
lithina 41
lurida 21
luteotactella, Walk. ... 59
maligna 88
melanula 60
melipnoa 68
melitoleuca 69
micracma 66
mochlias... 45
monocalama 82
musica 44
mythica 28
neocosma 35
nephelotis 46
nexella, Walk. 30
oligarchica 29
ophiogramma 53
orectis 56
oxyptera... 80
parabolella, Walk. ... 64
peltastis 52
phaëthontia 16
placidella, Walk. ... 63
polyxesta 72
porphyrinella, Walk. ... 9
proleuca 8
pultenææ, Lw. 24
reversella, Walk. ... 73
rimata 77
rubescens, Lw. 15
rubra 20
russata, Butl. 17
sarcinota 22
scotarcha 34
serina 79
setiotricha 27
silvicola 78
spilonota, Scott ... 14
stigmatias 2
stochastis 6
strigata, Lw. 55
subnexella, Walk. ... 32
subparallela, Walk. ... 30
synaula 54
tricrena 33
tuberculata 43
typhicola, Meyr. ... 76
undulatella, Walk. ... 36
unipunctana, Don. ... 26

Further Notes on Australian Coleoptera, with Descriptions of New Genera Species.

By the Rev. T. Blackburn, B.A.

[Read May 6, 1890.]

VII.

The twelve species described in the following pages are nearly all of exceptional interest, five of them requiring new generic names, two of them representing a "tribe" (in Lacordaire's sense of the word) of Curculionidæ not previously recorded as Australian, and another *(Dyschirius)* pertaining to a very widely distributed genus not previously recorded as South Australian.

CARABIDÆ.

TRIGONOTHOPS.

The difference between *T. plagiata*, Germ., and *lineata*, Dej., seems to consist mainly in the width and length of the black vittæ on the elytra; both being from South Australia (Adelaide district and Kangaroo Island), I suspect they are identical; *lineata*, Dej., is the older name.

T. flavofasciata, Chaud., seems to vary almost infinitely in markings; I do not possess an example coloured quite like the type, but have the var. *nigro-signata*, Chaud., with less dark colour than the type and other vars. with black markings much in *excess* of the type; the species seems to have a wide range (the extreme localities of my examples are Victoria and the Lake Eyre basin), but does not appear to be very common. *T. longiplaga*, Chaud., must be extremely like *T. pallidicollis*, Macl., but the description of the latter is hardly detailed enough to justify a decided opinion that species from such widely separated localities are identical.

DYSCHIRIUS.

D. Torrensensis, sp. nov. Rufo-ferrugineus, elytris pedibusque pallide testaceis (basi obscure triangulariter rufescenti, apice obscure picescenti), mandibulis apice corpore subtus (prosterno excepto) et prothoracis pedunculo piceis; clypeo antice emarginato: capite lævi antice inæquali; prothorace rotundato; elytris oblongo-ovatis convexis postice angustatis sat fortiter striatis, striis fortiter punctulatis, postice et striis et puncturis obsoletioribus, interstitiis subconvexis 3°, 5°, 7° que

punctis setiferis seriatim instructis); tibiis anticis extus dentibus 2 acutis parvis instructis et processu elongato apicali productis. Long., 2 l.; lat., $\frac{7}{10}$ l.

The surface sculpture of the head is complicated and very difficult to describe; the most conspicuous prominence is a ridge which runs down the middle, commencing quite indefinedly a little in front of the level of the hind margin of the eyes and narrowing forward (while becoming better defined) till it ends in quite a sharp point about the level of the front of the eyes; a longitudinal furrow traverses the middle of this ridge. The uppermost tooth on the external margin of the front tibiæ is very small indeed, being scarcely more than half as large as the lower one, which itself is but small.

As I do not possess a type of any of the previously described Australian *Dyschirii* I must compare this species with a common European species of the genus (*D. thoracicus*, Rossi). Apart from the totally different colouring, it is a stouter-looking insect than *D. thoracicus*, with longer mandibles, antennæ scarcely so stout, longitudinal channel of prothorax all but untraceable, elytra less narrowed (and more abruptly declivous) at the base, with very much stronger sculpture, the lower of the two external teeth on the front tibiæ somewhat smaller.

D. Torrensensis seems to resemble *D. zonatus*, Putz. (from N. Queensland), and to be extremely unlike *D. Mastersi*, Macl., and *D. Stephensi*, Macl. Apart from differences of marking (which may be variable), the present insect appears to differ from *D. zonatus*, *inter alia*, in the front margin of the clypeus being (not truncate, but) emarginate, in the elytra being (not depressed behind the scutellum, but) very evenly convex, and without a humeral tooth, and in the front tibiæ externally having (not two strong teeth, but) two rather exceptionally feeble teeth.

S. A.; banks of the Torrens near Woodville.

LAMELLICORNES.

PHYLLOTOCUS.

P. dispar, sp. nov. ♂ (?) Niger, subolivaceus; hirtus; antennis, palpis, pedibus (tarsis exceptis), segmentis ventralibus, pygidioque, flavis; elytrorum disco livido-brunneo; capite confertim fortiter rugulose, prothorace (hoc quam longiori paullo latiori) sat crasse minus crebre, elytris (his leviter striatis) subtilius subseriatim, pygidio (hoc ad apicem late leviter impresso) antice fortiter sparsius postice crebre obscure, corpore subtus sat fortiter (coxis posticis minus elongatis lævigatis exceptis) punctulatis. Long., $3\frac{2}{5}$ l.; lat., $1\frac{4}{5}$ l.

An extremely distinct species — perhaps nearest to *P. erythropterus*, Blanch., but with totally different coloration and puncturation. The pubescence is almost as in that species, but evidently shorter on the elytra; the hairs on the sides, undersurface and base of prothorax are white, the rest darker. The prothorax is longer and narrower than in *erythropterus*. The livid brown colour of the elytra covers most of the surface, the dark margin of each elytron being narrow and obscure except on the lateral margins and apex. The anterior tibiæ have two strong sharp teeth (one of them being the apical projection) externally.

This insect does not seem quite at home in *Phyllotocus;* the hind coxæ are exceptionally short, being scarcely longer on the external margin than the metasternum; the elytra do not quite reach the apex of the propygidium; the style of marking and colouring is nearest that of the glabrous species (Sir W. Macleay's "first section" of the genus), while the pubescence is exaggeratedly of the type of the second section; there is, moreover, nothing of the silky opacity so general in the hairy species of the genus. The general resemblance in colour and shape and puncturation to *Macrothops rostrata*, Macl., is extremely close, but the clypeus, palpi and antennæ are at least *very like* those of a *Phyllotocus* of the second section, though having only a single specimen I have not been able to dissect the head, and so cannot be sure of actual identity. The examination of a series of both sexes might probably justify the creation of a new generic name. I have considered the possibility of this being the undescribed sex of *Macrothops*, but if so the less dentate anterior tibiæ and short elytra would point to its being the male, whereas the much less complicated clypeus and short palpi would seem inconsistent with that supposition. In any case the yellow hind body and legs would seem to distinguish specifically from *M. rostrata.*

Western Australia; presented to me by C. French, Esq., Victorian Colonial Entomologist.

LEPIDIOTA.

In writing on this genus in the Proceedings of the Linnean Society of New South Wales (Vol. III. Ser. 2 pp. 848-855) I stated that unless I had seen examples only of one sex the sexual distinctions were very slight; I am now fairly sure that I have before me both sexes of two species belonging to it (*L. Darwini*, Blackb. and an undescribed one), and an examination of these specimens confirms me in the opinion I previously expressed. Unfortunately specimens of *Lepidiota* appear to be rare (though the species are relatively numerous), and I have not been able to devote a (supposed) male and female to dissection so as to arrive

at certainty on the question of their sex. In both the species alluded to above the male is a somewhat narrower and more parallel insect than the female, with the flabellum of the antennæ a little longer and the pygidium decidedly shorter, more transverse, and more closely scaly and punctured ; in both, moreover, the feeble costæ on the elytra are evidently better defined in the male than in the female, the elytra of the latter sex being more confusedly punctured and less nitid than in the former.

L. caudata, sp. nov. ♂ Sat parallela ; piceo-ferruginea, subiridescens ; sat nitida ; supra sparsissime subtus confertissime albido-squamulata ; pectore fulvo-hirsuto ; clypeo perbrevi, in medio reflexo-emarginato ; prothorace fortiter convexo sat transverso antice angustato, lateribus pone medium angulato-ampliatis postice vix sinuatis, angulis posticis acutis ; pygidii margine postico in medio acute minute dentato ; tibiis anticis tridentatis. ♀ Minus parallela ; haud iridescens ; minus nitida ; elytris paullo crebrius punctulatis. Long., 12 l. ; lat., ♂ $6\frac{1}{4}$, ♀ $6\frac{3}{4}$ l.

The sharp little tooth into which the hinder outline of the pygidium is abruptly drawn out in the middle at once distinguishes this species from all the previously described Australian *Lepidiotæ* (unless *Froggatti*, Macl., which I have not seen, but which is a very much larger insect). The third joint of the antennæ (as in most of the Australian *Lepidiotæ*) is longer than the second and than the fourth* ; in the male the flabellum is as long as the preceding 5 joints together, in the female a little shorter. In the male the pygidium is about a $\frac{1}{3}$ wider at its base than it is long down the middle, and is punctured closely and strongly ; in the female the length is scarcely different from the width, and the puncturation is feebler and more sparing. The suture is convex, and there are two somewhat less defined costæ on each elytron—all these convexities being stronger in the male than in the female. The prothorax is about $\frac{2}{3}$ again as wide as it is long down the middle, its base being half again as wide as its front, which is bisinuate and strongly margined. The whole upper surface (except the elytral costæ) is rather strongly and evenly and fairly closely punctured ; the white scales being extremely small and not filling up the punctures are very inconspicuous, and at the first glance the upper surface appears glabrous (I do not think that the male example before me is at all abraded). The hairs on the breast are not of a snowywhite colour (as they are in *Darwini*, Blackb.), but are pale fulvous.

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*This is at variance with the characters of *Lepidiota*, as quoted by M. Lacordaire in the "Genera des Coleopt."

Queensland ; sent to me by Mr. Hurst, of Brisbane, and also by Mr. Duboulay.

L. grata, sp. nov. ♂ (?) Minus parallela ; piceo-castanea ; subnitida ; supra sat dense subtus confertissime albo-squamulata, elytris lineis subconvexis subnudis sat læte ornatis ; pectore haud hirsuto ; clypeo perbrevi in medio fortiter reflexo emarginato ; prothorace sat convexo minus transverso antice angustato, lateribus crenulatis pone medium rotundato-ampliatis postice subsinuatis angulis posticis minus acutis ; pygidii margine postico sinuato-truncato, tibiis anticis tridentatis ; antennarum articulo 3° 4° æquali. Long., 9 l. ; lat., 5 l.

The flabellum of the antennæ is scarcely so long as the preceding 5 joints together. The pygidium across the base is slightly more than half again as wide as it is long down the middle ; it is very closely and rather finely punctured and scaly. The suture of the elytra and 4 other sub-parallel lines on the elytra are scarcely convex, but are almost devoid of white scales. The prothorax is about half again as wide as its length down the middle, its base being slightly more than half again as wide as its front, which is simply emarginate and devoid of a raised margin, as also is the middle part of the base ; its sides are much more closely and strongly crenulate than in *L. squamulata*, Waterh., *albohirta*, Waterh., and *caudata*, Blackb. The puncturation of the upper surface is fairly close and strong, and the scales are rather coarse, so as to give a general whitish tone except on the denuded lines of the elytra.

Resembles *L. Rothei*, Blackb., *rufa*, Blackb., and *degener*, Blackb., in its non-hirsute breast. It is nearest to *L. Rothei*, from which the equality of the 3rd and 4th joints of the antennæ will *inter alia* distinguish it ; the scales on the upper surface of *L. rufa* and *L. degener* are quite fine and hair-like.

Queensland ; sent to me by Mr. Oswald B. Lower, of Parkside.

NEOLEPIDIOTA, gen. nov.

A *Lepidiota* differt corpore haud squamulato, tarsis longissimis.

The insect for which I propose this name has been in my collection for a good many years past, during which I have been hoping to obtain more specimens, but as no other has yet come to light it will perhaps be as well to give it a name and publish as much information as possible concerning it. It is evidently very near *Lepidiota*, but the two characters mentioned above are inconsistent with its being placed in that genus. The front tarsi are quite half again, the intermediate nearly half again, and the hind just about, as long as their tibiæ. The upper surface is glabrous, except on the lateral margins, which are fringed with stiff hairs,

and at the base of the prothorax where some ciliæ project hindward; the legs and sterna are moderately hirsute. Having only a single specimen I have not been able to dissect, but as far as I can see the mouth organs are similar to those of *Lepidiota*. The 3rd joint of the antennæ is evidently shorter than the 4th; the clypeus is almost evenly rounded (scarcely sinuate) in front; the prothorax is not bisinuate at the base; and the ventral sutures are so much obliterated that the basal four ventral segments (except quite at the sides) have quite the appearance of being only one large segment; the hind tibiæ have two fairly well-defined oblique carinæ. I cannot form a decided opinion as to the sex of the specimen before me. The flabellum of the antennæ is not quite so long as the preceding five joints together, but the shape of the pygidium resembles that of the male of *Lepidiota*. In respect of all the characters not mentioned above I can find no difference from *Lepidiota*. The shape of the elytra (considerably dilated hindward) and their freedom from scales cause a general appearance suggestive of *Colpochila*, from which genus the strongly dentate claws, obliterated ventral sutures, and many other characters depart widely.

N. obscura, sp. nov. Ovata, sat convexa; minus nitida; rufopicea; prothorace (hoc transverso antice angustato, lateribus sat fortiter crenulatis) sat crebre, elytris (his obscure 3 vel 4 costatis) confuse minus crebre, pygidio sat sparsim, sat leviter punctulatis; metasterno crebre subtiliter punctulato; abdomine (segmento brevi apicali excepto) fere lævigato. Long., 10 l.; lat., 6 l. (vix).

The free margin of the clypeus is strongly reflexed. The prothorax is nearly twice as wide as long, the base being two-thirds again as wide as the front, and the sides being abruptly (and roundly) dilated just behind the middle as in *Lepidiota;* the hind angles are obtuse but quite well defined; both base and front are distinctly margined. The anterior tibiæ are tridentate externally, all the teeth being well defined, but not very sharp. The pygidium is not quite half again as wide as long, and is subvertical.

Australia; I am not quite sure of the exact locality, but I believe it to be in S. Australia.

PSEUDOCAVONUS, gen. nov. *(Oryctomorphides).*

Mentum fere ut *Nephrodopi*, laminam longitudinalem porrectam efficiens; palpi labiales breves articulo ultimo cylindrico; palpi maxillares elongati sat cylindrici sat graciles, articulo 3° quam 2us breviori, 4° duobus præcedentibus conjunctis minus breviori; antennæ maris 10-articulatæ, articulo 1° brevi apice valde dilatato, articulis 2-7 brevibus, 3-7 sub-

æqualibus fortiter transversis, flabello sat angusto articulis ceteris conjunctis quadruplo longiori; caput haud cornutum sed inter antennas transversim fortiter carinatum; clypeus sat declivis, antice rotundatus, marginibus fortiter reflexis; prothorax maris margine anteriori medio cornutus, basi valde lobatus, disco excavato; tibiæ anticæ acute 3-dentatæ, posteriores sat fortiter dilatatæ extus bicarinatæ; tarsi graciles tibiis sat longiores.

The antennæ resemble those of *Aneurystypus calvus*, Blackb., but their flabellum is longer in comparison with the rest of the organ than in any other *Dynastid* known to me. The maxillary palpi are longer than the basal 7 joints of the antennæ together. The general facies is nearest to *Cavonus* of genera known to me. Structurally this genus comes nearest, I think, to *Pseudoryctes*, which it resembles very closely in the form of the mentum and of the legs; its clypeus, however, is much less abruptly declivous. From *Teinogenys* (which I do not think I have seen) it appears to differ *inter alia* in its non-tuberculate head, strongly dilated posterior tibiæ and profoundly excavated prothorax. The very strong lobe into which its prothorax is produced behind will, I think, distinguish it from all the previously described genera of *Oryctomorphides*.

P. antennalis, spec. nov. ♂ Sat brevis; sat latus; sat nitidus; supra glaber (pilis longis adpressis, a prothoracis basi orientibus, exceptis), corpore subtus pygidio pedibusque longe dense hirsutis; ferrugineus, pilis pallidioribus, capite prothoracis latera et pedum marginibus carinisque infuscatis; clypeo parce fortiter, prothorace variatim (disco sparsim strigatim, lateribus antice crebre fortiter postice sparsim minus fortiter), scutello leviter obscure, pygidio (in medio lævigato) ad latera crebre leviter, punctulatis; prothoracis cornu lamelliformi in medio angustato-acuto, disco a basi ad apicem late excavato, partis excavatæ lateribus pone medium utrinque obscure tuberculatis; elytris fortiter punctulato-striatis, interstitiis vix convexis hic illic puncturis nonnullis sat magnis instructis. Long., 7—7$\frac{3}{5}$ l.; lat., 4—4$\frac{1}{5}$ l.

The coloration of the prothorax (in both the examples before me) is very peculiar, the interior surface of the excavation being of a pale ferruginous tint, while the rest of the surface is blackish-brown, but variegated with some ill-defined ferruginous spaces; the legs are rusty red in colour, but they are outlined with black, and the carinæ of the posterior 4 tibiæ are also black; each joint of the tarsi also has its apex more or less infuscate. The prothoracic excavation is somewhat definitely margined laterally, the margin being somewhat angulated at the point where the quasi-

tubercle is situated. The basal lobe of the prothorax is almost parallel-sided, and occupies about the middle third part of the whole width of the base, and its length is such that the portion behind a straight line joining the hind angles would be about as long as the scutellum. The prothorax is strongly margined all round except along the hinder edge of the excavation, its front angles being well defined but not very sharp, its hind angles much rounded off. The prothoracic horn seems to be formed by the front margin of the excavated part being reflexed upward into a lamina which narrows bisinuously to a somewhat obtuse point in the middle where it is at its highest (this structure is best seen by viewing the insect from a point directly in front of the head). Each elytron bears about 11 punctulate striæ, of which the first is near and parallel to the suture, while the rest are parallel (or nearly so) *inter se*, but run somewhat obliquely from the base hindward towards the suture; the first interstice (which is very wide in front and narrows hindward) bears numerous large punctures; the third a few, and the seventh a good many; the puncturation becomes confused and closer near the apex along the lateral portion.

Roebuck Bay, N.W. Australia; sent to me by Mr. French (Victorian Colonial Entomologist).

ELATERIDÆ.

PSEUDOLACON, gen. nov.

A *Lacon* differt figura angusta sat cylindrica, tarsis aliter conformatis, horum articulo 1° apicem versus sat fortiter, ceteris invicem minus fortiter, dilatatis.

The narrow cylindrical appearance of this insect would prevent its being associated at a first glance with *Lacon*, but on careful examination it seems to be really very near that genus, to which it would be referred by the tabulation of *Agrypnides* in M. Candeze's "Mon. des Elaterides." I think, however, that the shape, in conjunction with the peculiar structure of the tarsi, renders a new name necessary. The tarsi are moderately elongate (as in *Lacon*), but instead of being compressed and of equal width, or nearly so, they are somewhat strongly dilated at the base, and become gradually and strongly narrower to the apex, the last two joints being very slender. Each of the first four joints is in the form of a reversed cone; the tarsus is at its widest at the apex of the 1st joint, the 2nd joint being a little shorter than the 1st and about half as wide, the 3rd scarcely shorter than the 2nd, but narrower, the 4th a little shorter than the 3rd and much narrower, the 5th scarcely shorter than the preceding three together. The undersurface of the tarsi is pubescent, the first two joints of the

hind pair being densely clothed with long stout hairs or bristles. The prosternal projection behind the coxæ is more declivous than in *Lacon*. On the flanks of the prosternum there are feeble indications of a furrow for the reception of the tarsi; on the metasternum no trace whatever of a furrow. The antennæ do not differ notably from those of *Lacon*; they are short (reaching back to about the middle of the prothorax), and scarcely so stout as is usual in *Lacon*. The prosternal sutures are as in *Lacon*. The chin-piece (*mentonnière*) is very robust and almost erect.

P. rufus, sp. nov. Subcylindricus; totus rufus; setulis squami formibus pallidis brevibus sat sparsim vestitus; prothorace quam in medio longiori vix latiori, antice parum angustato, fortiter sat crebre punctulato, prope angulum posticum sat deplanato, lateribus minus arcuatis crenulatis ante basin sinuatis, angulis posticis subrectis lateraliter nec postice paullo productis, basi leviter concava; elytris sat fortiter punctulato-striatis, interstitiis sat angustis subconvexis transversim obscure rugatis vix manifeste punctulatis. Long., 4 l.; lat., $1\frac{1}{5}$ l.

The pallid scales with which the surface is thinly covered, both above and below, are placed for the most part in the punctures.

Roebuck Bay, W. Australia; sent to me by Mr. French.

HOMŒOLACON, gen. nov.

A *Lacon* differt antennis elongatis pectinatis, articulo ultimo in processu apicali subito angustato; tarsis gracilibus elongatis (posticis quam segmenti ventrales 2-4 conjuncti haud brevioribus).

The insect for which I propose this new generic name does not appear to differ notably from *Lacon* in any other respects than those mentioned above; its prothorax, however, is different from that of any *Lacon* known to me, having the sides very strongly rounded in the anterior two-thirds of their length (so that the prothorax a little in front of the base is scarcely wider than across the front margin), and then diverging again to the posterior angles. Of the antennæ joints 4-10 scarcely differ *inter se* in shape or size; each of them is about as long as the 2nd and 3rd joints together, and is strongly transverse, of triangular shape. Thus the entire antenna (which reaches back quite to the base of the prothorax) appears pectinated. The apical joint is suddenly narrowed on its inner side a little beyond its middle, so that its apical part (which is almost cylindrical) looks like a 12th joint, the portion behind the contraction being produced moreover on its inner side much less strongly than the preceding joints, so that it is longer than wide, even excluding the pseudo-12th joint.

H. gracilis, sp. nov. Sat elongatus; minus convexus; piceo-niger; setulis squamiformibus pallidis brevibus sat crebre vestitus; prothorace quam in medio longiori haud latiori, hoc (cum capite et corpore subtus) fortiter sat crebre punctulato, supra inæquali, angulis anticis sat productis acutis, angulis posticis acutis lateraliter (vix retrorsum) productis, lateribus crenulatis, basi quam margo anterior sat latiori; elytris puncturis subquadratis sat magnis in striis vix impressis seriatim positis, interstitiis angustissimis punctulatis (alternis elevatioribus). Long., $4\frac{1}{5}$ l.; lat., $1\frac{1}{5}$ l.

N. Territory of S. Australia.

TENEBRIONIDÆ.

PSEUDOCÆDIUS, gen. nov.

Cædio differt prothorace postice haud bisinuato, scutello nullo.

Although the insect for which I propose this name is extremely near to *Cædius*, it would be misleading to attribute it to that genus on account of the characters specified above. The absence of a scutellum forbids its association with *Cædiomorpha* or *Isopteron*, while from *Sobas* (which has no scutellum) it differs by its emarginate clypeus, posterior tibiæ strongly spinose and apical joint of maxillary palpi decidedly (though not strongly) securiform.

P. squamosus, sp. nov. Latus; minus convexus; piceus, squamis brevibus pallidis suberectis (his in prothorace confuse, in elytris seriatim, positis) vestitus; indumento terreo tectus (hoc raso, superficie subtilius sat crebre punctulata granulis sat crebris inter puncturas intermixtis); prothorace quam longiori plus duplo latiori, postice quam antice duplo latiori, mox intra margines distincte minus anguste deplanato, lateribus sat rotundatis, angulis anticis obtusis posticis subrotundatis vix distinctis, basi haud bisinuata; elytris obscure striatis, interstitiis subconvexis; tibiis anticis externe dentatis, posterioribus 4 fortiter spinosis. Long., $2\frac{1}{5}$ l.; lat., $1\frac{2}{5}$ l.

The anterior tibiæ on the internal margin are strongly bent at the base, thence nearly straight to the apex, where is a short stout spine; on the external margin they widen from the base very rapidly into a strong obtuse tooth a little above the middle, immediately below which the tibia is scarcely wider than at the base; thence the tibia widens externally in an arcuate manner to the apex, so that the apex itself is externally in the form of a very strong obtuse tooth. The front tarsi (which are very much shorter than the other four) lie back in repose in a furrow on the face of the tibia. Although the base of the prothorax is not bisinuate, there is a slight unevenness in its outline (which

otherwise is evenly convex hindward all across) on either side close to the hind angles, which gives to those angles a slight appearance of being directed hindward.

Roebuck Bay, N.W. Australia; sent to me by Mr. French (Victorian Colonial Entomologist).

ACANTHOLOPHUS.

A. Franklinensis, sp. nov. Oblongus; niger; albosquamosus, squamis niveis condensatis lineam longitudinalem a rostro ad elytrorum apicem recurrentem efficientibus; rostro utrinque supra antennarum basin spina longa valida, supra oculum spina trifida perlonga instructo; oculis angustis; antennarum funiculi articulo 2° 1° sat longiori; prothorace spinis acutis 4-seriatim instructis; elytris apice late divaricatis minute mucronatis 7-seriatim tuberculatis vel spinosis [serie 1ª suturali tuberculis parvis obtusis, 2ª tuberculis obtusis paullo majoribus (2 vel 3 posticis conicis acutis), 3ª tuberculis obtusis etiam majoribus (2 posticis permagnis conicis acutis), 4ª 1æ simili sed fere obsoleta, 5ª 1æ simili, 6ª tuberculis sat magnis (anticis obtusis, posticis acutis subspiniformibus), 7ª postice abbreviata tuberculis subspiniformibus, instructis]; pedibus albo-squamosis nigro-setosis.

An extremely distinct species remarkable for the well marked snowy scales with which it is clothed. These cover the rostrum from the base of the antennæ hindward, then continue as a line along the middle of the head, then fill the interval between the dorsal series on the prothorax (in the middle of which nevertheless is a narrow scaleless black line), and then as a narrow line occupy the scutellum and the suture quite to the apex of the elytra; they are also more interruptedly (but still very conspicuously) dispersed over the sides of the prothorax and elytra, form a vitta between the sixth and seventh series of tubercles on the latter, and are thinly sprinkled over the undersurface and the legs. The parts not covered with snowy white scales appear to the naked eye quite black, but are seen under a lens to be thinly sprinkled with brown scales. The head and prothorax bear (no tubercles, but) only large sharp spines; that over the eye is like the antler of a deer, consisting of two long spines (the front one curved forward and upward, the hinder curved upward and hindward, and sending off a short branch anteriorly at about half its length) springing from a common stalk, of which the hinder is the longer, and is scarcely shorter than the distance from its base to the apex of the rostrum; on the prothorax the dorsal series each contains five long sharp spines gradually decreasing hindward, of which the front one is the longest, and is bifid, while each lateral series consists of a spine near the base about as long as the longest of

the dorsal series, and another (still longer) in front of the middle, before and behind which a small spine may be observed. Long., 8 l.; lat., 3 l.

In the collection of Mr. J. Anderson, of Port Lincoln; a single example was taken by Mr. T. Kenneth S. Browne near Franklin Harbour.

RHAMPHUS.

R. australis, sp. nov. Niger, antennis (clava plus minus infuscata excepta) testaceis, tarsis piceo-testaceis; crebre rugulose minus crasse punctulatus; elytris fortiter striatis, striis obscure punctulatis, interstitiis subconvexis. Long., 1 l. (vix.)—$1\frac{1}{4}$ l.; lat., $\frac{2}{5}$—$\frac{4}{5}$ l.

This species is extremely like the European *R. flavicornis*, Schonh.; it is, however, a larger and broader species with the prothorax more strongly transverse and at its widest across the base (where its width is about twice its length down the middle); the puncturation is much closer and more rugulose throughout, and the sculpture of the elytra is very different, the striation being strong and the interstices more or less convex and rugulose while the striæ are quite obscurely punctured so that the sculpture which strikes the eye is that of the interstices, not of the striæ. The third joint of the tarsi is more broadly dilated.

Petersburg, S.A.

R. distinguendus, sp. nov. Niger, antennis (clava excepta) plus minus pallescentibus; prothorace sat crasse minus crebre punctulato; elytris sat fortiter punctulato-striatis, interstitiis vix convexis vix perspicue punctulatis. Long., $\frac{4}{5}$ l.—1 l.; lat. $\frac{2}{5}$ l.

This species resembles *R. flavicornis* even more strongly than does the preceding but differs in the interior coxæ being less widely separated; indeed this difference in the structure of the anterior coxæ and a somewhat greater dilatation of the second joint of the antennæ are the only distinctions that I can specify.

Petersburg, S.A.

List of Plants collected during Mr. Tietkens' Expedition into Central Australia, 1889.

By Baron Sir F. von Mueller, F.R.S., &c., and Professor R. Tate, F.L.S., &c.

[Read April 1, 1890.]

Last year Mr. Tietkens was placed in charge of a party by the Central Australian Exploring and Prospecting Company, Adelaide, to explore the MacDonnell Range and the country to the west and south of it. The period of exploration embraced the months of April to August, and the plants, which form the subject of this report, were collected by Mr. Tietkens and his assistants during that time.

As Mr. Tietkens' map and journal are not yet published the approximate position of each locality, referred to in this report, here follows :—

Proceeding northward from Charlotte Waters the localities are :—

Crown Point, on the River Finke, about 40 miles north of Charlotte Waters.

Horse-shoe Bend, 20 miles north of Crown Point.

Orraminna, 40 miles south of Alice Springs.

Emily Gap (in the MacDonnell Range), 8 miles south of Alice Springs.

Burt Plain or the Table-land on the north of the MacDonnell Range, the scarped front of which constitutes that range. See East, Trans. Roy. Soc. S. Aust., vol. xii., p. 47, 1889.

Bonn Springs, 10 miles north-east of Alice Springs.

Painta Springs, 15 miles north-west of Alice Springs.

Thence along the MacDonnell Range are :—

Mount Sonder, long. 132° 20′, lat. 23° 35′. *Mareena Bluff*, *Mount Razorback*, *Glens Helen* and *Farewell* being adjacent thereto.

Glen Edith, long. 131° 10′, lat. 23° 50′.

Thence about west to the boundary line with West Australia.

Watson Hills, about midway between Glen Edith and

Gill's Creek, in Cleland's Hills, long. 130° 30′, lat. 23° 48′.

"Sandstone Rocks," long. 129° 35′, lat. 23° 50′.

Laura Vale, 6 miles from Mount Rennie, in long. 129° 15′, lat. 23° 35′.

Mount Leisler, in the Kintore Range, long. 128° 25′, lat. 23° 30′, 16 miles from north-east of Lake McDonald.

Lake McDonald—Thence returning by way of Lake Amadeus to near Charlotte Waters, there are :—

Warman Rocks, south-east of Lake McDonald, long. 128° 54′, lat. 23° 55′.

Mount Harris, in Blood's Range, long. 129° 27′, lat. 24° 40′.

Mount Olga is 17 miles north of west from *Ayers' Rock*, which latter is in long. 130° 50′, lat. 25° 30′ ; *Mount Conner*, long. 131° 30′, lat. 25° 30′. These island-like elevations are situated about half a degree to the south of *Lake Amadeus*.

Basedow Range, long. 132° 10′, lat. 25° 5′. Between here and Charlotte Waters are *Erldunda*, *Goyder's Springs*, *Ayers' Range* and *Eringa*, the last 30 miles west of Charlotte Waters.

The collection numbers 250 species, and compares not unfavourably with the joint results of Giles and Gosse in their several expeditions to this region. Nevertheless, the whole collection is somewhat disappointing, and adds but scantily to the records of the Australian flora. This is all the more to be regretted, as the season of 1889 was exceptionally favourable, and the part of the region traversed was a novel one for botanical research. Much of the material has been gathered without due discrimination as to flower and fruit, and consequently much time has been lost in the determination of the species, otherwise we might have had a much larger array of species.

The collection is characteristic of the Eremian Region, and the high land of the MacDonnell Range does not seem to possess any other type of vegetation, though it offers several specific differences, and some few generic, as compared with the low level tracts which stretch southward from its base.

The following species are new to the Australian flora :—Eriostemon argyreus, *n. sp.* ; Sida podopetala, *n. sp.* ; Calotis latiuscula, *n. sp.* ; Goodenia fascicularis, *n. sp.* ; Ipomoea racemigera, *n. sp.* ; Teucrium grandiusculum, *n. sp.* ; Eremophila Tietkensii, *n. sp.* ; and Eriocaulon graphitimum, *n. sp.*

The following species are additional records to the Flora of Extra-tropical South Australia* :—

Hybanthus miniatus, *F. v. M.*

Phyllanthus minutiflorus, *F. v. M.* Extends from Port Darwin to the Upper Victoria River.

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* Melaleuca Leucadendron, *Linn.*, which is widely distributed in the northern parts of the continent, extending to the Indian Archipelagos and Malayan Peninsula, has been received from between Eyre's Creek and Hergott.—F. v. M.

Trema cannabina, *Lour.* An Oriental species, reaching as far south as N.W. Victoria; this adds a new genus to the Flora.

Crotalaria incana, *Linne.* An exotic of tropical and sub-tropical distribution; is known throughout the northern half of this continent.

Acacia Bynoeana, *Bentham.* Is known from the coast region of N.A.

Acacia acradenia, *F. v. M.* Inhabits the dry zone from Nickol Bay to the head waters of the Victoria River.

Acacia patens, *F. v. M.* Same distribution as the last.

Heliotropium fasciculatum, *R. Brown.* Inhabits Q. and N.A.

Erechthites lacerata, *F. v. M.*

Rotala verticillaris, *Linne.* An Oriental species, also known from Sturt's Creek.

Ammannia auriculata, *Willdenow.* A tropical and sub-tropical species of the Old World; is known from the littoral tracts of Queensland.

Eucalyptus setosa, *Schauer.* Belongs to the littoral tracts of N.A. and Q.

Grevillea Chrysodendron, *R. Brown.* Confined to the littoral tracts of N.A. and tropical W.A., and of Q.

Oldenlandia galioides, *F. v. M.* Same distribution as the last.

Halgania integerrima, *Endlicher.* W.A., south-eastern interior.

Eremophila viscida, *Endlicher.* W.A., south-eastern interior.

Fuirena glomerata, *Lamarck.* Belongs to the warm regions of both hemispheres; for the most part, a littoral species in N.A., Q., and N.S.W. This is an additional genus to the Flora.

Fimbristylis acuminata, *Vahl.* An Oriental species, reaching to Queensland.

Dilleniaceae.

Hibbertia glaberrima, *F. v. M.* Mount Olga.

Capparideae.

Cleome viscosa, *Linne.* Glen Helen; Mount Razorback; east end of Lake McDonald.

Capparis spinosa, *Linne.* Near Mount Sonder.

Capparis Mitchelli, *Lindley.* Dashwood Creek.

Cruciferae.

Erysimum Blennodia, *F. v. M.* Near Basedow Range and W. of Eringa.

Sisymbrium trisectum, *F. v. M.* Basedow Range; sandhills W. of Erldunda; W. of Eringa.

Stenopetalum nutans, *F. v. M.* Bonn Springs.

Menkea sphærocarpa, *F. v. M.* Between Mount Olga and Ayers Rock.
Capsella cochlearina, var. ochrantha, *F. v. M.* Mount Sonder.
Lepidium phlebopetalum, *F. v. M.* Glen Helen; Basedow Range; Erldunda; W. of Eringa.

Violaceae.

Hybanthus miniatus, *F. v. M.* Gill's Creek.

Pittosporeae.

Pittosporum phillyræoides, *DeCand.* W. end of Lake McDonald.

Droseraceae.

Drosera Burmanni, *Vahl.* Glen Farewell; Laura Vale.
Drosera Indica, *Linne.* With the last.

Elatineae.

Bergia perennis, *F. v. M.* Near Mount Sonder.

Hypericineae.

Hypericum Japonicum, *Thunberg.* Mount Sonder; W. of MacDonnell Range.

Rutaceae.

Eriostemon argyreus, *F. v. M.* and *Tate.* Near Mount Sonder.

Zygophylleae.

Zygophyllum fruticulosum, *DeCand.* Mount Harris.
Tribulus terrestris, *Linne.* Mount Sonder; Ayers Rock.
Tribulus astrocarpus, *F. v. M.*

Geraniaceae.

Erodium cygnorum, *Nees.* Scrub S.E. of Goyder Springs.
Oxalis corniculata, *Linne.* Mount Sonder.

Malvaceae.

Lavatera plebeia, *Sims.* Eringa Station.
Plagianthus glomeratus, *Bentham.* Lake McDonald.
Sida corrugata, *Lindley.*
Sida inclusa, *Bentham.* Horse-shoe Bend; Warman Rocks.
Sida cryphiopetala, *F. v. M.* Mount Olga.
Sida podopetala, *F. v. M.* and *Tate.* Glen Helen; Warman Rocks.
Abutilon otocarpum, *F. v. M.* Glen Helen; Blood's Range.
Abutilon halophilum, *F. v. M.* Glen Helen; Laura Vale.
Hibiscus microchlaenus, *F. v. M.* Bonn Springs; near Mount Sonder; Laura Vale.
Hibiscus Pinonianus, *Gaudichaud.* North shore of Lake McDonald.

Gossypium Sturtii, *F. v. M.* Orraminna rock-hole; Mount Sonder; near Gill's Creek; Mount Olga.
Gossypium australe, *F. v. M.* Glen Helen; Laura Vale.

Sterculiaceae.

Macregoria racemigera, *F. v. M.* W. end of Lake McDonald.
Brachychiton Gregorii, *F. v. M.* Mareena Bluff.
Melhania incana, *Heyne.*
Hannafordia Bissillii, *F. v. M.* "A shrub two feet high." Glen Edith.
Commerçonia magniflora, *F. v. M.* A shrub eight feet high. Mount Sonder; Mount Olga.
Commerçonia Kempeana, *F. v. M.* Glen Edith; Watson Hills.

Euphorbiaceae.

Euphorbia erythrantha, *F. v. M.* Sandhills, east of Lake McDonald.
Euphorbia Drummondii, *F. v. M.* Mount Razorback; Lake Amadeus.
Euphorbia eremophila, *Cunn.* Emily Gap.
Phyllanthus minutiflorus, *F. v. M.* Glen Helen.
Phyllanthus thesioides, *Bentham.* Burt Plain.
Phyllanthus lacunarius, *F. v. M.* Waterholes, MacDonnell Range.
Phyllanthus trachyspermus, *F. v. M.* Mount Sonder.

Urticaceae.

Trema cannabina, *Lour.* Near Mount Sonder.
Ficus platypoda, *Cunn.* Mount Razorback; Glen Helen.

Casuarineae.

Casuarina Decaisneana, *F. v. M.* Watson Hills; about Lakes McDonald and Amadeus.

Sapindaceae.

Diplopeltis Stuartii, *F. v. M.* Mt. Sonder and vicinity; Mt. Conner; around Lake McDonald.
Dodonaea lanceolata, *F. v. M.* Dashwood Creek.
Dodonæa viscosa, *Linne.* Mt. Sonder; Blood's Range; Mt. Olga; N. of Ayers-Range; W. of Eringa.
Dodonaea microzyga, *F. v. M.* Between Mt. Olga and Ayers Rock; Erldunda; W. of Eringa.

Frankeniaceae.

Frankenia laevis, *Linne.* Lakes McDonald and Amadeus.

Portulaceae.

Portulaca oleracea, *Linne.* Mount Razorback.
Portulaca filifolia, *F. v. M.* Orraminna rock-hole.
Claytonia ptychosperma, *F. v. M.* Eringa.

Caryophylleae.

Polycarpaea synandra, *F. v. M.* Dashwood Creek.

Amarantaceae.

Euxolus Mitchelli, *F. v. M.* Orraminna; Mount Olga.
Ptilotus incanus, *Poiret.* Mount Sonder; Glen Helen.
Ptilotus exaltatus, *Nees.* West of Mt. Sonder.
Ptilotus helipteroides, *F. v. M.* Table-land W. of Eringa.
Ptilotus nobilis, *F. v. M.* Mount Sonder.
Ptilotus latifolius, *R. Brown.* Native well at "Sandstone Rocks."
Ptilotus leucocoma, *Moquin.* Near Mount Sonder.

Salsolaceae.

Atriplex vesicarium, *Heward.* Granite rocks north of Ayers Range.
Dysphania simulans, *F. v. M.* and *Tate.* Near Mount Sonder.
Rhagodia nutans, *R. Brown.* N. side of Lake McDonald.
Chenopodium rhadinostachyum, *F. v. M.* Laura Vale.
Kochia villosa, *Lindley.* Lake McDonald; Erldunda.
var. aphylla. Erldunda.
Kochia spongiocarpa, *F. v. M.* Mount Olga.
Bassia sclerolænoides, *F. v. M.* Plains S.W. of Erldunda
Salsola Kali, *Linne.* Common.

Ficoideae.

Trianthema crystallina, *Vahl.* W. end of Lake McDonald.
Trianthema pilosa, *F. v. M.* Mount Sonder; W. side of Lake Amadeus.
Molluga hirta, *Thunberg.* Mount Sonder.
Molluga Cerviana, *Seringe.* Glen Helen.

Polygonaceae.

Polygonum plebeium, *R. Brown.* Mount Razorback.

Phytolacceae.

Gyrostemon ramulosus, *Desfont.* Glen Edith; west end of Lake Amadeus.
Codonocarpus cotinifolius, *F. v. M.* Glen Helen; Mount Sonder; Dashwood Creek. A tree twelve feet high.

Nyctagineae.

Boerhaavia repanda, *Willd.* N. shore of Lake McDonald.
Boerhaavia diffusa, *Linne.* Mount Olga; Bonn and Painta Springs.

Thymeleae.

Pimelea microcephala, *R. Brown.* S. end of Lake Amadeus.

Leguminosae.

Brachysema Chambersi, *F. v. M.* Laura Vale and west of.
Isotropis atropurpurea, *F. v. M.* Mount Olga.
Burtonia polyzyga, *Bentham.*
Crotalaria medicaginea, *Lamarck.* Bonn Springs, Mount Sonder; Laura Vale; Mount Olga.
Crotalaria dissitiflora, *Bentham.* Laura Vale; Gill's Creek.
Crotalaria incana, *Linne.* Near Mount Sonder.
Lotus australis, *Andrews.* Mount Sonder; Laura Vale; Mount Olga.
Psoralea patens, *Lindley.* Mount Olga.
Indigofera viscosa, *Lamarck.* Bonn Springs; Mount Sonder; "Sandstone Rocks;" Warman Rocks.
Indigofera hirsuta, *Linne.* Mounts Sonder and Leisler.
Indigofera monophylla, *DeCand.* Laura Vale; Gill's Creek. A bush one to two feet high.
Indigofera linifolia, *Retzius.* Laura Vale.
Indigofera brevidens, *Bentham.* Mount Leisler; sandhills E. of Lake McDonald.
Clianthus Dampieri, *Cunn.* Erldunda and W. of Eringa.
Glycine clandestina, *Wendland.* Blood's Range.
Glycine sericea, *Bentham.* Glen Helen; Gill's Creek.
Swaisonia coronillifolia, *Salisb.* Scrub S.E. of Goyder's Springs.
Swainsonia Burkei, *F. v. M.* Glen Helen.
Swainsonia stipularis, *F. v. M.* Scrub S.E. of Goyder's Springs.
Kennedya prorepens, *F. v. M.* Near Mount Sonder.
Erythrina vespertilio, *Bentham.* Mount Sonder. "A tree 30-40 feet high, 1-2 feet diameter of stem; deciduous, shedding its leaves after seeding. The wood is exceedingly light, and is used by the natives for shields. Pod about four inches long."
Rhynchosia minima, *De Candolle.* Mount Sonder; Glen Helen.
Vigna lanceolata, *Bentham.* Painta Spring; Glen Helen. Roots eaten by the aboriginals. *V. suberecta*, Bentham, is the better name of the two.
Cassia Sophera, *Linn.* Mount Sonder.
Cassia pleurocarpa, *F. v. M.* Glen Helen.
Cassia desolata, *F. v. M.* Mount Leisler; Laura Vale.
Cassia phyllodinea, *R. Brown.* W. end of Lake Amadeus.
Petalostylis labicheoides, *R. Brown.* Mt. Sonder; Glen Helen.
Acacia Bynoeana, *Bentham.* W. end of Lake Amadeus.
Acacia spondylophylla, *F. v. M.* Mount Sonder.
Acacia strongylophylla, *F. v. M.* Mount Sonder; W. end of Lake Amadeus; Mount Olga.
Acacia pyrifolia, *De Candolle.* Gill's Creek; Laura Vale; sandhills E. of Lake McDonald.

Acacia notabilis, *F. v. M.* Mount Sonder ; Gill's Creek.
Acacia salicina, *Lindley.* Mount Sonder ; W. end of Lake Amadeus ; table-land W. of Eringa.
Acacia dictyophleba, *F. v. M.* Sandhills N. of Mount Harris.
Acacia patens, *F. v. M.* Mt. Sonder. A shrub 5 to 8 feet high.
Acacia acradenia, *F. v. M.* Mount Harris.
Acacia doratoxylon, *Cunningh.* Twelve miles S.E. of Gill's Creek ; Mount Olga ; table-land W. of Eringa.
Acacia aneura, *F. v. M.* W. of Lake Amadeus ; table-land W. of Eringa.
Acacia cyperophylla, *F. v. M.* Warman Rocks.
Acacia Farnesiana, *Willdenow.* Mount Sonder.

Rosaceae.

Stylobasium spathulatum, *Desfontaines.* Erldunda.

Salicariae.

Rotala verticillaris, *Linne.* West of Macdonnell Range.
Ammannia multiflora, *Roxburgh.* Mount Sonder.
Ammannia auriculata, *Willdenow.* Mount Sonder.

Haloragеae.

Haloragis aspera, *Lindley.* Mount Sonder.
Haloragis Gossei, *F. v. M.* N. side of Lake McDonald.

Myrtaceae.

Calycothrix longiflora, *F. v. M.* Sandhills N. of Mount Harris.
Thryptomene Maisonneuvii, *F. v. M.* Near Mount Sonder ; Glen Edith ; Gill's Creek ; "nearly all sandhills."
Baeckea polystemona, *F. v. M.* Mount Harris.
Eucalyptus setosa, *Schauer.* Laura Vale ; Gill's Creek.
Eucalyptus gamophylla, *F. v. M.* Mount Sonder.
Eucalyptus sp. Sandhills E. of Lake McDonald.

Umbelliferae.

Hydrocotyle trachycarpa, *F. v. M.* Mount Olga.
Didiscus glaucifolius, *F. v. M.* Glen Helen ; Glen Edith ; Mount Olga.

Loranthaceae.

Loranthus Exocarpi, *Behr.* Near Mount Sonder.
Loranthus gibberulus, *Tate.* Glen Helen.
Loranthus pendulus, *Sieber.* Glen Edith ; Mount Conner ; W. of Eringa, &c.

Proteaceae.

Grevillea Chrysodendron, *R. Brown.* Glen Edith.
Grevillea juncifolia, *Hooker.* Horseshoe Bend ; sandhills S. of Mount Rennie.

Grevillea agrifolia, *Cunningham.* Glen Farewell; Glen Edith, and all along the Macdonnell Range.
Hakea lorea, *R. Brown.* The variety with much-divided leaves. Watson Hills; Lindsay Hills.
Hakea purpurea, *Hooker.* Sandhills between Lakes Amadeus and McDonald.

Rubiaceae.

Oldenlandia galioides, *F. v. M.* West of Macdonnell Range.
Canthium latifolium, *F. v. M.*
Pomax umbellata, *Sonder.* W. end of Lake Amadeus.

Cucurbitaceae.

Melothria Maderaspatana, *Cogniaux.* Horse-shoe Bend; near Mount Sonder; Mount Olga.

Compositae.

Brachycome ciliaris, *Lessing.* Lake Amadeus.
Minuria leptophylla, *DeCandolle.* West of Eringa.
Calotis plumulifera, *F. v. M.* West of Eringa.
Calotis latiuscula, *F. v. M.* and *Tate.* Mount Olga; west of Eringa.
Aster Ferresii, *F. v. M.* Mount Olga.
Podocoma cuneifolia, *R. Brown.* Mount Sonder.
Pluchea Eyrea, *F. v. M.* Glen Helen.
Pterigeron liatroides, *Bentham.* Laura Vale.
Polycalymma Stuartii, *F. v. M.* and *Sonder.* West of Eringa.
Bidens bipinnata, *Linne.* Mount Sonder.
Centipeda orbicularis, *Loureiro.* Mount Sonder; S.E. corner of Lake McDonald.
Glossogyne tenuifolia, *Cassini.* Mount Sonder.
Angianthus strictus, *Bentham.* Near Charlotte Waters.
Gnaphalium luteo-album, *Linne.* Painta Spring.
Senecio Gregorii, *F. v. M.* Mount Sonder.
Erechthites lacerata, *F. v. M.* Glen Farewell; Basedow Range.

"Our plants agree in every respect with the one gathered by me in 1851 near Elder's Range, and described soon subsequently in the Linnaea. It seems specifically distinct from the genuine *E. arguta.* In some respects it approaches *Senecio ramosissimus* and *S. odoratus*; Drummond's plant, 328, referred by Bentham to the former species, belongs, however, to *S. leucoglossus.*" *F. v. M.*

Helichrysum Cassinianum, *Gaudichaud.* Erldunda; Eringa.
Helichrysum Lawrencella, *F. v. M.* West of Eringa.
Helichrysum semifertile, *F. v. M.* Granite rocks, N. of Ayers Range; west of Eringa.

Helichrysum lucidum, *Henckel.* South shore of Lake McDonald.
Helipterum Fitzgibboni,, *F. v. M.* West of Eringa.

Campanulaceae.

Isotoma petraea, *F. v. M.* Crown Point; Glen Edith; Mount Olga.
Wahlenbergia gracilis, *DeCand.* Mount Olga; Basedow Range.

Goodeniaceae.

Leschenaultia striata, *F. v. M.* Leaves often flat towards the base; fruit about 1½ inches long, very narrow; seeds prismatic-cubic, nearly one-tenth of an inch long, brownish outside, somewhat fringy-papillular at the margin. Mt. Olga.
Velleya connata, *F. v. M.* Laura Vale; Warman Rocks.
Goodenia grandiflora, *Sims.* Dashwood Creek.
Goodenia fascicularis, *F. v. M.* and *Tate.* Basedow Range.
Calogyne Berardiana, *F. v. M.* West of Eringa.
Scaevola ovalifolia, *R. Brown.* Mount Sonder. A variety with blue flowèrs and verrucular-rough fruits.

Jasmineae.

Jasminum lineare, *R. Brown.* Bonn Spring; Mount Sonder.
Jasminum calcareum, *F. v. M.* Mount Sonder.

Asclepiadeae.

Cynanchum floribundum, *R. Brown.* Emily Gap; Glen Helen; Watson Hills.
Daemia Kempeana, *F. v. M.* Mount Sonder; Laura Vale; Warman Rocks.
Marsdenia Leichhardtii, *F. v. M.* Mareena Bluff.

Convolvulaceae.

Ipomœa Muelleri, *Bentham.* Horseshoe Bend; Bonn Spring; Mount Sonder; Glen Helen.
Ipomœa racemigera, *F. v. M.* and *Tate.* Glen Helen.
Convolvulus erubescens, *Sims.* Mount Olga.
Evolvulus linifolius, *Linne.* Glen Helen; Mount Olga.

Solanaceae.

Solanum ferocissimum, *Lindley.* Bonn Spring; Laura Vale.
Solanum Sturtianum, *F. v. M.* The prickly variety. West end of Lake McDonald.
Solanum orbiculatum, *Dunal.* Mount Sonder.
Solanum ellipticum, *R. Brown.* A variety with narrower leaves. Mount Sonder; Lakes McDonald and Amadeus; granite rocks N. of Ayers Range; Mount Conner.
Datura Leichhardtii, *F. v. M.* Mount Sonder.

Nicotiana suaveolens, *Lehmann.* Mount Sonder; Glen Edith; Gill's Creek; Laura Vale.

Duboisia Hopwoodi, *F. v. M.* Glen Edith; tableland west of Eringa Station. "Shrub eight to ten feet high; foliage thick, very green and fresh-looking; fatal to camels."

Scrophularinae.

Buechnera linearis, *R. Brown.* Near Mount Sonder. Bentham already doubted the mutual specific distinctness of *B. urticifolia*, *B. linearis*, *B. tenella*, *B. grandis* and *B. ramosissima.* Recently Schumann (Flora von Kaiser Wilhelm's Land, 117) proposed to unite them under the name *B. urticifolia;* but that appellation becomes particularly misleading, when applied to the whole complex of forms, because even the typical plant, delineated by Bauer (Endl. Iconogr., 78), shows no leaves, which could be compared to those of a nettle. Far apter among R. Brown's specific designations would be that of *B. gracilis* as collective, unless the *B. Browniana* (Schinz in den Verhandl. des Bot. Ver. v. Brandenb. xxi., 194) just described from S.W. Africa, should prove conspecific with the Australian plant, as it would seem from the notes offered, in which case the name would be very eligible also for the species, established by R. Brown. The name *Buechnera* seems first to have been correctly written by Murray in the 13th edition of Linnaeus' Syst. Veg. (1774); the genus was dedicated to the celebrated physician Andreas Elias Buechner, F.R.S., who was President of the Acad. Cæs. Leop. Carol. at Linnaeus' time, and who published among other works some on Materia Medica.

Stemodia viscosa, *Roxburgh.* A variety with narrow leaves. Mount Sonder.

Bignoniaceae.

Tecoma australis, *R. Brown.* A starved variety with minute leaves: flowers and fruits are however absent; "a creeper hanging 30 feet from the rocks." Mount Sonder; Gill's Creek.

Pedalinae.

Josephinia Eugeniae, *F. v. M.* Watson Hills.

Acanthaceae.

Justicia procumbens, *Linne.* Orraminna; Mt. Sonder; Mt. Conner; W. of Eringa.

Labiatae.

Plectranthus parviflorus, *Henckel.* Mount Sonder; Mount Olga.

Prostanthera striatiflora, *F. v. M.* Mount Sonder; Glen Edith.

Prostanthera Wilkieana, *F. v. M.* Mount Sonder; "Sandstone Rocks."

Teucrium racemosum, *R. Brown.* Mount Sonder.
Teucrium grandiusculum, *F. v. M.* and *Tate.* Watson Hills; Gill's Creek.

Verbenaceae.

Spartothamnus teucriiflorus, *F. v. M.* Bonn Spring; Glen Helen; about Lake McDonald.
Dicrastylis ochrotricha, *F. v. M.* Laura Vale.
Dicrastylis Gilesii, *F. v. M.* Mount Conner.
Clerodendrum floribundum, *R. Brown.* Watson Hills; Laura Vale.

Myoporinae.

Eremophila Tietkensii, *F. v. M.* and *Tate.* Mount Sonder; Laura Vale.
Eremophila Bowmanni, *F. v. M.* Mount Olga.
Eremophila Mitchelli, *Bentham.* Plains S.W. of Erldunda.
Eremophila Paisleyi, *F. v. M.* The broad-leaved form, the ovulary beset with longer hairlets than usual. Plains S.W. of Erldunda; W. end of Lake Amadeus.
Eremophila Freelingii, *F. v. M.*
Eremophila Latrobei, *F. v. M.* Laura Vale; Warman Rocks.
Eremophila Macdonnellii, *F. v. M.* Samphire-swamps.
Eremophila viscida, *Endlicher.* Between Mount Conner and Basedow Range. Endlicher gave the description from a specimen in an only commencing state of flowering. From one, out of the Botanic Museum of Vienna, the lithographic plate in the "Myoporinous Plants" was furnished. The example now obtained shows the flowers well developed; thus the corolla is rather above an inch long.
Eremophila Gilesii, *F. v. M.* Warman Rocks.
Eremophila maculata, *F. v. M.*; var. West end of Lake Amadeus; sandhills N. of Mount Harris.

Asperifoliae.

Pollichia Zeilanica, *F. v. M.* Mount Sonder; Emily Gap. "Grows on all sandhills; camels are very fond of it."
Heliotropium asperrimum, *R. Brown.* Laura Vale; Mt. Olga.
Heliotropium ovalifolium, *Forskael.* S. side of Lake McDonald.
Heliotropium tenuifolium, *R. Brown.* Mt. Sonder; Mt. Leisler; Ayers Rock; Painta Spring.
Heliotropium fasciculatum, *R. Brown.* Sandhills about Lake McDonald.
Halgania integerrima, *Endlicher.* A variety larger in all its parts than the typic plant. Mount Harris.
Cynoglossum Drummondii, *Bentham.*

Cycadeae.

Encephalartos Macdonnelli, *F. v. M.* Painta Spring.

Liliaceae.

Wurmbsea dioica, *F. v. M.* Glen Edith ; Gill's Creek ; Laura Vale ; Warman Rocks ; Mount Olga.
Xerotes leucocephala, *R. Brown.* Sandhills, Gill's Creek; Laura Vale.

Commelineae.

Commelina ensifolia, *R. Brown.* Glen Helen.

Fluviales.

Potamageton sp. West of Macdonnell Range.

Eriocauleae.

Eriocaulon graphitimum, *F. v. M.* and *Tate.* W. end of Macdonnell Range.

Cyperaceae.

Cyperus difformis, *Linne.* Glen Helen.
Cyperus fulvus, *R. Brown.* Glen Helen.
Fimbristylis communis, *Kunth.* Gill's Creek.
Fimbristylis acuminata, *Vahl.* W. end of Macdonnell Range.
Fuirena glomerata, *Lamarck.* W. end of Macdonnell Range.

Gramineae.

Panicum decompositum, *R. Brown.* Glen Helen.
Andropogon bombycinus, *R. Brown.* Mt. Razorback.
Pappophorum commune, *F. v. M.* Ayers' Rock.
Sporobolus actinocladus, *F. v. M.* Glen Helen.
Danthonia bipartita, *F. v. M.* A variety with often only one fertile flower in the spikelet.
Eleusine cruciata. *Lamarck.* S. shore of Lake McDonald ; Mt. Conner.
Eragrostis diandra, *R. Brown.* Glen Helen.

Rhizospermae.

Marsilea quadrivalvis, *Linne.* Mount Sonder.

Filices.

Ophioglossum vulgatum, *C. Bauhin.* Plains S.W. of Erldunda.
Cheilanthes vellea, *F. v. M.* Mount Sonder.
Cheilanthes tenuifolia, *Swartz.* Bonn Spring; Mt. Sonder; Glen Helen ; Laura Vale ; Mt. Leisler ; Mt. Olga.
Grammitis rutæfolia, *R. Brown.* Mt. Conner.

DESCRIPTIONS OF NEW SPECIES.

By Baron Sir F. von Mueller and Professor R. Tate.

ERIOSTEMON ARGYREUS, *F. v. M.* and *Tate.*

Very lepidote all over, with narrow- or elliptic-lanceolar leaves, but gathered without any flowers or fruits. Allied to *E. anceps* as far as foliage is concerned. Central Australia.

SIDA PODOPETALA, *F. v. M.* and *Tate.*

Extensively bearing a close but short indumentum; leaves rather small, on short petioles, from orbicular- to lanceolar-ovate, irregularly denticulated except towards the base; stipules linear-filiform, early deciduous; peduncles mostly axillary and solitary, articulated near the flower, as long as the latter; calyx comparatively large, its lobes deltoid, shorter than the tube or nearly as long; the latter semiovate or finally almost semiglobular, faintly many-streaked; petals yellow, nearly equilateral, by about one-third longer than the calyx, slightly bilobed, the upper half much dilated, the lower half cuneated and towards the base densely ciliolated; staminal tube short; styles numerous, only connate near the base; ovularies much beset with very short hairlets, connected into a much depressed mass, and this surrounded by a conspicuous, somewhat crenulated, disk. Central Australia.

This plant has the aspect of an *Abutilon*, but its ovularies are uniovulate. The width of the expanded flowers is somewhat more than an inch. The form of the petals is rather exceptional in the genus, they being somewhat suddenly contracted into the long, almost stalk-like basal portion.

This species differs from *S. cleisocalyx* in broader and pointed leaves, in longer peduncles, and in organization of the flowers, though *S. cleisocalyx* may be dimorphous and is known to us as yet in the clandestinely flowering state only; the fruits of the two may also be different. From *S. platycalyx* our new plant is separated by narrower leaves, by the calyces being not provided with very prominent ridglets, and further by the petals emerging beyond the calyx.

CALOTIS LATIUSCULA, *F. v. M.* and *Tate.*

Erect, rather robust, beset with short scattered hairlets; leaves comparatively large, those of the branches simply sessile or with broad base somewhat clasping, from cuneate- to elliptic-lanceolar, flat, indented towards the summit or quite entire; headlets of flowers arranged in almost corymbous panicles, on slender peduncles; involucral bracts nearly lanceolar; floral ray yellow; solid portion of fruit almost broader than long; spinules generally 9 to 10, beyond the base disconnected, few much shortened, the

others about as long as the seed-bearing portion of the fruit or somewhat longer. Central Australia.

This plant has also been gathered near the Finke River by the Rev. H. Kempe. The leaves are in form similiar to those of *C. cymbacantha*, while the fruits are much like those of *C. lappulacea*, but the headlets and leaves are much larger.

IPOMOEA RACEMIGERA, *F. v. M.* and *Tate.*

Imperfectly beset with short hairlets ; leaves small, on rather long stalks, cordate, from the conspicuously bilobed lower portion gradually narrowed into an acute apex, without any incisions or denticles, on the surface nearly glabrous ; racemes as long as the leaves or longer with several flowers ; pedicels much shorter than the calyx ; outer sepals almost cordate towards the base, gradually acuminated ; corolla small, hardly half exserted ; stamens three times shorter than the corolla ; style short ; ovulary glabrous. Glen Helen.

Branches slightly verrucular-rough. Leaves on the only and fragmentary specimen available, $1\frac{1}{2}$ inches long. Racemes possibly in amply developed inflorescences cymously arranged. Corolla white. Fruit unknown.

This is nearest *I. chryseides*, but that plant has a cymous inflorescence, blunt sepals and a yellow corolla ; the fruit of the two may also be different. In aspect the plant is also not unlike *Hewettia bicolor.*

GOODENIA FASCICULARIS, *F. v. M.* and *Tate.*

Dwarf, herbaceous, depressed, stoloniferous, almost glabrous ; radical leaves linear- or cuneate-lanceolar, often somewhat indented ; stem-leaves quite linear, entire, the uppermost frequently fasciculated ; flowers axillary and terminal, solitary, rather small ; peduncles about twice as long as the flowers, bractless ; lobes of the calyx very narrow, about as long as its tube ; corolla yellow, beset as well as the calyx with appressed hairlets outside, all the lobes almost equally bilobed, the two upper outward scariously appendiculated ; style much shorter than the corolla, bearing hairlets at and towards the summit ; stigma-cover much broader than long ; fruit ovate-globular, only its summit emerging ; seeds surrounded by a conspicuous membrane. Basedow Range.

Near *G. heteromera*, *G. filiformis*, and *G. O'Donnellii.*

TEUCRIUM GRANDIUSCULUM, *F. v. M.* and *Tate.*

Beset with spreading, very short, somewhat glandular hairlets ; upper leaves sessile, flat, equally green on both sides, from rhomboid- to cuneate-ovate, entire towards the base, thence serrated ; floral leaves similar in form, but smaller and crowded ;

flowers all axillary, solitary, on short stalklets, much exceeding the floral leaves; lobes of the calyx fully as long as the tube or even somewhat longer, semilanceolar, pointed; corolla rather large, white, outside imperfectly beset with minute hairlets, its middle lobe hardly double as long as the adjacent lobes, about twice as long as broad; stamens and style nearly equalling the corolla in length; fruitlets almost ellipsoid, upwards slightly beset with hairlets. Central Australia.

Only the upper part of the plant seen. Leaves thus measuring one inch and gradually less in length. Corolla usually about two-thirds of an inch long, the upper lobes almost as large as the lateral lobes. Fruitlets nearly one-eighth of an inch long.

The plant when out of blooming has the aspect of a *Scaevola*. The flowers are larger than those of any other Australian species.

EREMOPHILA TIETKENSII, *F. v M.* and *Tate*.

Branchlets robust; leaves rather large, greyish from an extremely short vestiture, elongate or narrow-lanceolar, entire but somewhat flexuous, gradually narrowed to the apex, slightly decurrent into the rather conspicuous petiole; flowers axillary, solitary; pedicel about as long as the calyx, thickened upwards; segments of the calyx lanceolar, much narrowed towards the base, overlapping at the margin, nearly glabrous, soon scarious, reticulate-venular, somewhat dotted; style glabrous; ovulary imperfectly beset with glandular very minute hairlets, ovate-globular, but the summit conically contracted; ovules four in each cell. Central Australia.

Leaves from two to three inches long, half to two-thirds of an inch broad, without any lustre, thinly keeled; the lateral venules few and faint or concealed. Calyx-segments nearly two-thirds of an inch long. Corolla and fruit unknown. Allied to *E. Clarkei*, *E. Oldfieldii* and *E. graciliflora*, but not combinable with any of them.

Note on the Soaring of the Hawk.

By T. W. Kirk, F.R.M.S., &c., of the Geological Survey Department of New Zealand.

[Read December 3rd, 1889.]

The peculiar notched or cut-away shape of the primary feathers in the wings of many birds, more especially of the "Raptores," or "Birds of Prey," has often attracted my attention, and the purpose of such emargination has been a source of curiosity to me for many years.

It will be observed that the outer portion of both the anterior and posterior vanes of the primary feathers of the wing (I am speaking of the feather as though it were in position in the expanded wing) are cut away—the former for about half its length, the latter for rather less. The form of these feathers has, of course, been frequently described, but I have never seen any explanation of why their shape should be as it is; indeed, I believe no such explanation has been published. I recently stumbled, so to speak, upon a discovery of what may possibly lead to a solution of the question.

When up country a short time ago I saw a large Hawk *(Circus Gouldi)* shot while soaring. After receiving the charge it continued to soar, although rapidly descending, and fell at some distance with both wings extended. On going to pick it up I was surprised to observe that, though quite dead, its wings were still expanded, and that the primaries were locked, or kept extended, by a partial reversal of their vanes—the terminal half of the posterior vane of each feather overlapping the corresponding portion of the front vane of the feather immediately behind it.

The question arose, Was this position of the feathers due to accident, or had the bird the power of placing them in this apparently unusual relationship? and if the latter, with what object?

After a careful examination I replaced the vanes in what, until more information is obtained, must be regarded as their correct position. I then extended the wing, and after a few experiments found that by manipulating the joint with the fingers, so as to give a slight rotary motion, just before full expansion was attained, the primaries could be made to take the position they occupied when first examined—that is, the locked position. This seems to prove that the bird had the power of, at will, altering the relative position of these feathers. If such a supposition can be placed beyond doubt, it will give a decided indication of the

reason for their peculiar outline, and may perhaps throw much light on the still vexed question of flight; for it would appear that this locking of the feathers together with the setting of the elbow joint, described by a celebrated naturalist, should be of considerable assistance to the bird in easing the strain which would otherwise be imposed upon the wing muscles during soaring —a strain which various experiments have shown would be very great—indeed, almost insupportable, unless the muscles were relaxed at short intervals; but as birds sometimes remain soaring for hours it is evident that no such relaxation or flapping takes place.

It may here be mentioned that in the case of *C. Gouldi*, young birds of the first year do not soar, but on the contrary indulge in frequent flappings, and as the primaries do not possess the well-defined emarginations so conspicuous in older birds, it is evident that they cannot lock the wings in the manner already described. I am aware that there are apparent objections to the theory I have suggested, such as that the partial change in the position of the primaries would seem to lessen the resistance which the expanded wing could give to the air; also that all soaring birds do not possess notched wing feathers, and that some birds which do not soar have them.

I have not had the opportunity to minutely examine the internal structure of the wing, but feel sure that, although the anatomy of that organ has received great attention, and is apparently well understood, there will yet be found some muscle either set apart for the purpose of altering the position of these feathers in the manner indicated, or one the secondary function of which it is to do so.

The whole question is one which cannot be decided save by an extensive series of observations and experiments in the field, aided by the most careful anatomical work in the laboratory.

This brief note is written not with any pretence to settle the matter, but in the hope that others who possess greater facilities for conducting experiments and research may be induced to undertake a systematic study of the subject.

On the Geological and Botanical Features of Southern Yorke-Peninsula, South Australia.

By Professor Ralph Tate, F.G.S., F.L.S.

[Read December 2nd, 1889.]

A glance at the map of Yorke-Peninsula, on which is delineated the chief physiographic features, cannot fail to suggest to the thoughtful mind that the southern portion, which has a general east and west trend, has been connected in comparative recent times only with the northern part. This is indicated by the broad belt of salt-marsh-land, which stretches across from Hardwicke Bay on the north to Sturt Bay on the south, whilst salt lagoons abound adjacent thereto, more particularly on the north side.

Standing on the high ground at Warooka and looking eastward an extensive panoramic view is spread out before you, embracing the whole of the depressed area and much beyond it; one's imagination is but little tasked to conceive that a strait once occupied the area of the existing salt-marsh, no inconsiderable portion of which is covered by water for a considerable part of the year. Indeed, it seems only necessary to remove the ramparts of blown-sand, which girdle the forementioned bays, to permit the sea once again to flow through and convert Southern Yorke-Peninsula to an island.

Long since I was impressed with this idea, which should it prove correct, I was then led naturally to anticipate certain floral peculiarities, probably having affinities with Kangaroo Island and Southern Eyre-Peninsula. The fact that this large tract of country is for the most part unsettled rendered exploration by oneself rather too serious and arduous an undertaking, and it was not till November of this year that an opportunity was presented to me, through the kind services and companionship of Mr. Matthews, of Yorketown, and Mr. Phillips, of Moorowie, of satisfying myself by personal examination of the main points of interest regarding the geology and botany of this hitherto scientifically unexplored region. The circuit of the coast-line occupied a week. The value of the results exceeded my expectations, and in the belief that my observations will be acceptable to those interested in the subject of the migration of plants and of the evidences of recent geological changes, I venture without further apology to submit them to you.

I. SKETCH OF THE GEOLOGICAL FEATURES

I. Pleistocene Deposits.

Southern Yorke-Peninsula may be described as a saucer, the lip being constituted of blown-sands, loose atop but more or less consolidated below, generally having a breadth of a half to two miles, and attaining elevations up to 200 feet or so. Inside the lip are extensive areas of flat marsh-lands or shallow salt-pans, constituted of sands with much shell-debris, loose or variously compacted; in the majority of cases the top layer forms a hard pavement-like surface of a few inches thick; less commonly these low areas are levelled up with a natural whiting, of good quality, for a depth of at least three or four feet.

The low-levels are varied by ridges, which seem to owe their origin to wave-action, or they may be of the nature of sand-bars.

The fossils in the consolidated calciferous sandstone throughout the whole area belong to existing species.

The whiting has been examined for microzoa by Mr. W. Howchin, F.G.S., but he fails to find any trace of them. I suggest that the material has originated by the accumulation of exfoliated shell-substance, washed out of the incoherent shell-banks.

The whole of Southern Yorke-Peninsula is constituted of these Pleistocene deposits, except such limited areas as are now to be mentioned.

II. Eocene Limestones.

The sea-cliffs of Point Turton, which are about 40 feet high, are composed of a red polyzoal limestone, sometimes very dense and marble-like, also exhibiting most pronounced current-bedding. Point Turton is the northern termination of a ridge, which has a general N.N.W. and S.S.E. trend and attains an elevation of 200 feet or so at Warooka; by this physical feature, it may be inferred that this limestone forms the western boundary of the Great Salt-Marsh for a little more than half its length. From the few fossils observed, the Warooka ridge is an outlier of the Eocene limestones which form the sea-cliffs on the east coast of Yorke-Peninsula, extending from near Black Point, by Surveyor's Point (Port Vincent), Stansbury, Wool Bay to Point De Mole at Edithburg.

III. Archæan Rocks.

At Point Souttar, and along the coast for a few miles to the westward, mica-schists, occasionally gneissoid, appear in low reefs on the shore-line. Similarly at Corney Point, the Pleistocene cliffs are based on mica-schist, intersected by narrow granite veins, in which the felspar largely predominates. These conditions are repeated at Daly Head. At an unnamed point, S.W.

from Warrenben and N. of Royston Head, gneiss appears; this is intruded by granite-veins carrying wolfram. The base of West Cape, Reef Head, Cape Spencer, south side of Rhino Head, and the coast-line between Hillock Point and Point Yorke is composed of metamorphic rock, more or less granitoid.

In all the above exposures, and these are all that are known on the coast,* the archæan rocks do not in any instance rise to more than about 20 feet above sea-level, though the Pleistocene sands are piled up upon them to heights up to 200 feet or so. Archæan rocks were brought to view in a well-sinking about three miles inland from Point Souttar, and apparently at not much above sea-level.

IV. General Remarks.

The Great Salt-Marsh is a deserted sea-way, whether by the formation of the barriers of blown-sand at its seaward boundaries, or by a moderate elevation, I cannot decide without accurate levelling, and the same uncertainty applies to the other low-level tracts in Southern Yorke-Peninsula; though it is more probable that some slight elevation of the land has taken place, so as to be in accord with the evidences of accurate levels taken on other parts of the South Australian coast-line. The whole country is devoid of water-courses, and everywhere the land rises abruptly from the shore.

The islets in Pondalowie Bay and those off Cape Spencer, and the Althorpes, are wholly or nearly so made of tabular masses of Pleistocene sandstones, from which it may be inferred that they are remnants of a more extended coast-line.

Wedge Island and the others of the Gambier Group, as also many off the Port Lincoln coast, are of the same nature; which leaves no choice but to regard them either as parts of a former land-connection between Southern Yorke-Peninsula and Eyre-Peninsula and perhaps Kangaroo Island, or that they are remnants of larger insular masses.

In pre-pleistocene times, the majority at least of the Archæan outcrops were submerged reefs or low islets constituting an archipelago of very considerable area. This condition must have been followed by elevation sufficiently great to form a beach-line commensurate with the amount of the present degraded material, the whole then became fused together by sand-drifts and a junction with Yorke-Peninsula was effected. To-day erosion has

* The Government Geologist, in his Geological Map of South Australia, 1886, shows a continuous outcrop of igneous rock from Corney Point to Point Yorke—this exaggeration may have been necessitated by the small scale of the map; the rest of the area under consideration is uniformly coloured to represent Tertiary.

largely taken the place of accumulation, as is attested by the truncation of the Pleistocene-deposits, so that the Althorpes and other adjacent islets have come to be severed from the main mass.

II. SKETCH OF THE BOTANICAL FEATURES.

If my interpretation of the geological record be right, then Southern Yorke-Peninsula was either a part of Southern Eyre-Peninsula and Kangaroo Island or was brought in near proximity by land extension from each area during the epoch of living plant-species. Whilst the presence of the Great Salt-Marsh may have proved a barrier to the migration of species of southern and western origin in a northerly direction. But whatever explanation is offered to account for the great floral contrasts between these two portions of the Peninsula, the botanical differences are so marked as to be a matter of common observation, and yet the climatic and hydrographic conditions are absolutely the same on either side of the Great Salt-Marsh.

On the North side of the Great Salt-Swamp the country is a savannah, timbered with *Casuarina quadrivalvis* and *Melaleuca parvifolia*, and interspersed with small trees of *Eucalyptus odorata*, *Pittosporum phillyræoides* and *Acacia sclerophylla*, whilst the chief undershrubs are *Bursaria spinosa* and *Myoporum insulare*.

With the exception of the Warooka Ridge, the botany of which resembles that of the country on the north side, most of South Yorke-Peninsula is covered with a dense Mallee-Scrub, here and there with open glades; whilst on the exposed south-east area the country is more heath-like, the shrubs being much dwarfed.

The chief constituents of the Mallee-Scrub are *Eucalyptus dumosa*, *E. uncinata*, *E. santalifolia* and *E. goniocalyx* (this genus is solely represented by these mallees, not a single specimen of a gum having been observed), *Acacia anceps*, *A. calamifolia* and *A. retinodes*, *Exocarpos spartea*, *Templetonia retusa*, *Beyeria opaca*, *Pimelea serpyllifolia*, *Eremophila Brownii*, &c.

Many of the species of the scrub-lands are gregarious, both as regards the smaller as well as the larger shrubs.

The chief shrub of the marsh-lands is *Melaleuca decussata*, interspersed amongst which are open areas clothed with *Cladium filum*, whilst the slight elevated ground around and within carries *Casuarina quadrivalvis*. *Melaleuca pustulata* forms dense thickets around the salt lagoons.

List of Species.—The total number of species observed is 235; of these 41 are unrecorded for Yorke-Peninsula, and therefore are restricted presumably to the Southern Section. Because of the

great floral contrasts in the two areas, I think it desirable to furnish a full list of the species. In my Census of the Flora of South Australia (Trans. Roy. Soc., S. Aust., vol. XII., 1889), the column Y indicates the Northern Section of the Peninsula, except for a few species, which were added as the result of my recent exploration while the latter pages of the contribution were passing through the press.

The asterisk denotes the restricted species.

RANUNCULACEÆ:—*Clematis microphylla. Ranunculus parviflorus.*

DILLENIACEÆ:—*Hibbertia stricta, H. virgata, *H. Billardieri,* Hillock Point.

LAURACEÆ:—*Cassytha glabella, C. pubescens, C. melantha.*

PAPAVERACEÆ:—*Papaver aculeatum.*

CRUCIFERÆ:—*Capsella elliptica. *Lepidium foliosum;* cliffs in Pondalowie Bay.

DROSERACEÆ:—*Drosera Menziesii.*

FRANKENIACEÆ:—*Frankenia lævis.*

PITTOSPOREÆ:—*Pittosporum phillyræoides. Bursaria spinosa. Billardiera cymosa. Cheiranthera linearis.*

POLYGALEÆ:—*Comesperma volubile.*

RUTACEÆ:—*Correa speciosa. Eriostemon capitatus.*

LINEÆ:—*Linum marginale.*

ZYGOPHYLLEÆ:—*Zygophyllum fruticulosum. Nitraria Schoeberi.*

GERANIACEÆ:—*Pelargonium australe. Geranium pilosum. Oxalis corniculata.*

SAPINDACEÆ:—*Dodonæa humilis, D. stenozyga.*

STACKHOUSIEÆ:—*Stackhousia linarifolia.*

MALVACEÆ:—*Plagianthus glomeratus, *P. microphyllus,* salt marshes. *Lavatera plebeia.*

STERCULIACEÆ:—*Lasiopetalum discolor; *L. Schulzenii,* West Cape and Hillock Point.

EUPHORBIACEÆ:—*Poranthera microphylla. *Phyllanthus calycinus,* Corney Point and Hillock Point. *Beyeria opaca. Adriana quadripartita.*

CARYOPHYLLEÆ:—*Sagina apetala. Spergularia marina, S. rubra.*

ILLECEBRACEÆ:—**Scleranthus pungens,* sandy scrub-land near Pondalowie Bay.

POLYGONACEÆ:—*Rumex Brownii. Muehlenbeckia adpressa.*

CHENOPODIACEÆ:—*Atriplex paludosum, A. cinereum. Rhagodia Billardieri. Enchylæna tomentosa. Kochia oppositifolia. Salicornia arbuscula, S. australis. Salsola Kali. Suaeda maritima.*

AMARANTACEÆ:—**Polycnemon pentandrum;* saline marshes, Marion Bay. *Ptilotus spathulatus.*

URTICACEÆ:—*Parietaria debilis.*

CASUARINEÆ:—*Casuarina quadrivalvis, C. distyla.*

Leguminosæ : — *Eutaxia empetrifolia. Pultenæa tenuifolia ; *P. acerosa*, heath-lands, S.W. coast. **Templetonia retusa. Goodia medicaginea. Lotus australis. Kennedya monophylla, K. prostrata. Acacia spinescens : **A. rupicola*, **A. calamifolia*, **A. anceps* and **A. retinodes*, very common and gregarious ; *A. microcarpa, A. brachybotrya, A. sclerophylla, A. salicina, A. longifolia.*

Thymeleæ :—**Pimelea flava, P. glauca, P. serpyllifolia ;* common on heath land.

Crassulaceæ :—*Tillæa verticillaris.*

Rosaceæ :—*Acæna ovina.*

Ficoideæ :—*Mesembrianthemum æquilaterale, M. australe. Tetragonia implexicoma.*

Onagreæ :—**Epilobium glabellum.*

Myrtaceæ : — *Calycothrix tetragona. *Melaleuca decussata*, marshes and wet heath-lands, common ; *M. parviflora, M. acuminata, M. pustulata. Eucalyptus odorata, E. oleosa, *E. goniocalyx, E. uncinata, *E. santalifolia.*

Rhamnaceæ :—*Pomaderris racemosa, P. obcordata. Cryptandra vexillifera.*

Santalaceæ :—*Santalum acuminatum, S. persicarium. Choretrum glomeratum. Exocarpos cupressiformis, E. spartea, E. aphylla.*

Haloragieæ :—*Haloragis aspera.*

Umbelliferæ :—*Apium prostratum. Daucus brachiatus.*

Loranthaceæ :—*Loranthus pendulus.*

Rubiaceæ :—*Opercularia varia*, Hillock Point. *Asperula oligantha. Galium umbrosum, G. australe.*

Compositæ :—*Aster axillaris, A. lepidophyllus, A. exul, A. Huegelii. Vittadinia australis. Minuria leptophylla. *Brachycome Muelleri*, widely spread ; *B. exilis. *Toxanthus Muelleri. Millotia tenuifolia. Erechthites hispidula. Senecio lautus. *Cotula filifolia*, salt-marshes, Marion Bay. *Stuartina Muelleri. *Ixodia achilleoides*, West Cape, Cape Spencer. *Podosperma angustifolium. *Ixiolæna supina*, cliffs in Pondalowie Bay. *Athrixia tenella. Cassinia spectabilis. Podolepis canescens, P. rugata. Gnaphalium luteo-album, G. Japonicum, G. indutum. Leptorrhynchos squamatus, L. Waitzia. Helipterum hyalospermum. Helichrysum lucidum, H. obtusifolium*, var. *tephrodes, H. leucopsidium, H. apiculatum, H. retusum. *Angianthus pleuropappus*, marsh-lands ; *A. tomentosus. Skirrophorus strictus, *S. Preissianus*, salt-marshes. *Calocephalus Brownii, Microseris Forsteri.*

Campanulaceæ :—**Isotoma scapigera*, marsh-lands, Corney Point, and about the Great Salt-Swamp. *Wahlenbergia gracilis.*

Goodeniaceæ :—*Velleya paradoxa. Scævola crassifolia, *S. micro-*

carpa, not uncommon ; *S. linearis. Goodenia ovata, G. varia, G. geniculata, G. pinnatifida.*

PRIMULACEÆ :—*Samolus repens.*

CONVOLVULACEÆ :—*Convolvulus erubescens.* **Dichondra repens*, swampy ground, Daly Head. *Wilsonia humilis.*

BORAGINEÆ :—*Eritrichium Australasicum. Myosotis australis. Cynoglossum suaveolens.*

APOCYNEÆ :—*Alyxia buxifolia.*

GENTIANEÆ :—*Sebæa ovata ;* **S. albidiflora*, natural pasture-land, Marion Bay. *Erythræa spicata.*

PLANTAGINEÆ :—*Plantago varia.*

LOGANIACEÆ :—**Mitrasacme paradoxa*, wet places, Marion Bay ; **Logania crassifolia, L. ovata, L. linifolia.*

SOLANACEÆ :—*Solanum simile. Lycium australe. Nicotiana suaveolens.*

EPACRIDEÆ :—*Styphelia Richei, S. patula, S. ovalifolia.*

LABIATÆ :—*Teucrium sessiliflorum, Westringia rigida, Prostanthera chlorantha.*

OROBANCHEÆ :—*Orobanche Australiana.*

SCROPHULARINEÆ :—**Limosella aquatica. Euphrasia Brownii.* **Veronica distans*, heath-lands, common.

MYOPORINEÆ :—*Myoporum insulare, M. viscosum, M. humile. Eremophila Brownii.*

CONIFERÆ :—*Callitris verrucosa.*

ORCHIDEÆ : — *Thelymitra longifolia. Prasophyllum fuscum, P. patens. Microtis porrifolia.*

LILIACEÆ :—*Xerotes dura, X. effusa. Dianella revoluta. Bulbine semibarbata. Thysanotus Baueri.* **Tricoryne elatior*, very common. *Chamæscilla corymbosa.*

JUNCACEÆ :—*Juncus communis.*

FLUVIALES :—*Triglochin centrocarpa.* **Ruppia maritima.*

RESTIACEÆ :—**Leptocarpus Brownii*, Melaleuca-scrub at Stone Hut, Marion Bay.

CYPERACEÆ :—**Schœnus nitens*, Stone Hut. **Isolepis riparius*, Stone Hut ; *I. nodosus.* **Cladium filum*, subsaline swamps ; **C. junceum*, Stone Hut ; *C. lanigerum, C. deustum. Lepidosperma gladiatum, L. viscidum.*

GRAMINEÆ :—*Spinifex hirsutus. Lepturus incurvatus. Stipa elegantissima,* **S. teretifolia*, rocks by the sea ; *S. aristiglumis, S. scabra. Dichelachne crinita. Agrostis Solandri. Sporobolus Virginicus. Danthonia penicillata. Agropyron scabrum. Distichlis maritima. Triodia irritans. Poa cæspitosa, P. lepida.*

FILICES :—*Cheilanthes tenuifolia.*

The census of the plants of Yorke-Peninsula is, at present, as follows :—

Northern Section :—Total species, 421. Restricted species, 230.
Southern Section :— " " 232. " " 41.

Species in common, 191.

The majority of the restricted species in the Southern section belongs to the flora characteristic of much of the west and mid-portions of the southern coast of Australia, as indeed the whole flora bears this complexion, which is in no small measure due to the richness in sea-coast-species. So far as South Australia is concerned, the florula of South Yorke-Peninsula has a strong resemblance to that of Kangaroo Island and South Eyre-Peninsula ; of the species constituting this common facies the following are noteworthy :—

	Kangaroo Id.	S. Eyre-Peninsula.
Hibbertia Billardieri	*	
Lepidium foliosum	*	
Lasiopetalum Schulzenii	*	*
Polycnemon pentandrum	*	
Templetonia retusa	*	*
Pultenæa acerosa	*	*
Goodia medicaginea	*	*
Acacia anceps		*
rupicola	*	*
retinodes	*	*
Melaleuca decussata	*	*
Eucalyptus santalifolia	*	*
goniocalyx	*	
Ixodia achilleoides	*	*
Ixiolæna supina	*	*
Cassinia spectabilis	*	
Toxanthus Muelleri	*	*
Angianthus pleuropappus		*
Skirrophorus Preissianus	*	*
Helipterum obtusifolium, *var.* tephrodes	*	*
Isotoma scapigera		*
Logania crassifolia	*	*
Veronica distans	*	*
Leptocarpus Brownii		*
Schœnus nitens	*	*
Stipa teretifolia	*	*

In this connection, I may add that a land-snail, *Bulimus Mastersi*, which has been known only from Port Lincoln to Eucla, occurs all over South Yorke-Peninsula. Though the facies of the florula recalls those of Kangaroo Island and the Port

Lincoln District, yet it is wanting in several of their salient forms, such as species of *Grevillea*, *Cryptandra*, *Xanthorrhœa*,* various genera of *Myrtaceæ*, *Eucalyptus corynocalyx*, &c.

Much of Southern Yorke-Peninsula is virgin-country, and though sheep have been run all over it in past years, yet it is fairly free from alien plant-species. The extra-Australasian species number 31, or about 13·5 per cent. of the total species, the same as for Kangaroo Island; all the species occur in Kangaroo Island and at Port Lincoln. Some very wide-spread species have not yet been observed, such as:—*Hypericum Japonicum*, *Stellaria glauca*, *Lepidium ruderale*, *Solanum nigrum*, *Lythrum hyssopfolia*, *Luzula campestris*, *Juncus bufonius*, *Anthistiria ciliata* and *Ophioglossum vulgatum*.

The only species whose presence is difficult to account for in the present state of our knowledge of its distribution is *Sebæa albidiflora*, as its western limit was thought to be the Mount Gambier District, where I found it in 1881.

Acacia anceps is peculiar to the Port Lincoln district, and must be very local, as I have not seen it in life there; in S. Yorke-Peninsula it is widely spread.

Isotoma scapigera extends from King George Sound to Fowler Bay and Streaky Bay, and reaches its eastern limit in S. Yorke-Peninsula.

Callitris verrucosa in a varietal form occurs only between West Cape and Cape Spencer. It is of a regular pyramidal form, attaining to a height of about ten feet, fruiting, however, at eighteen inches to two feet. The cones are slightly under half-inch diameter, quite smooth and racemosely clustered in groups up to five and six; the foliage is a bright green.

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* An arborescent grass-tree is reported to occur five or six miles north of Yorketown; but specimens have not yet reached me; it is an addition to District Y. Dr. James has forwarded me *Thryptomene Miqueliana*, gathered by him in the scrub six miles from Moonta; this is the first definite locality in S. Australia for it, the only record being "Spencer's Gulf," on the authority of Warburton. *Cassia Sturtii* is another addition by the same collector.

Further Notes on Australian Coleoptera, with Descriptions of New Genera and Species.

By the Rev. T. Blackburn, B.A.

[Read October 7, 1890.]

VIII.

NITIDULIDÆ.

CRYPTARCHA.

I am at a loss to understand why *C. flavipennis* and *flavoguttata*, Reitter, are included by Mr. Masters in his Catalogue of Australian insects. The author of those species gives their habitat as "India, or."

COLYDIIDÆ.

MINTHEA.

I have before me several specimens of an insect which has recently been found in the South Australian Museum in the wood of native curiosities. It is evidently a member of this genus, originally founded on a South American species, and which has since been reported from New Guinea and the Malayan Archipelago. It appears to be very close to *M. similata*, Pasc., so close indeed that I do not think it well to give it a new name (especially when I consider the probability of its not being an indigenous Australian insect). I should judge, however, that it is a somewhat narrower and more elongate insect, from its differing thus from the figure of *M. squamigera*, Pasc., to which Mr. Pascoe calls *M. similata* "exceedingly like," without mentioning any difference of shape; moreover, Mr. Pascoe says that the prothorax of *M. similata* is anteriorly "somewhat broader than the head," whereas in the examples before me I do not think that the head is any narrower than the front of the prothorax; but as I do not find any other distinction, and the shape of *M. similata* is not actually stated, but only arrived at by inference, and the slight discrepancy in the width of the head may be a mere trifling error of observation, or even a sexual character, it is quite likely that this may be *M. similata*.

CUCUJIDÆ.

LÆMOPHLŒUS.

L. pusillus, Schönh. I have received examples of this apparently cosmopolitan insect (which I cannot ascertain to have been

previously recorded by name as Australian) taken in produce that was probably imported. I suspect, however, that this is in reality the insect which figures in Masters' "Catalogue" as *L. testaceus*, Fab. According to Dr. Erichson (Ins. Deutsch. III., pp. 320 and 321) the species which Fabricius described as *Cucujus testaceus* is a *Læmophlæus* (occurring under the bark of trees in Germany), quite distinct from the cosmopolitan *Cucujus pusillus* of Schönherr, which lives on rice and other dry produce; but the latter was mistaken for the former by Stephens (Illust. Br. Ent. Maud. IV., p. 224), where it figures erroneously as *C. testaceus*, Fab. Dr. Erichson is confirmed in his statement by De Marseul in his Catalogue of European *Coleoptera*, and also by Gemminger and Harold. The insect now before me should, therefore, stand thus in our catalogue—

LÆMOPHLŒUS (CUCUJUS) PUSILLUS, *Schön.*
L. (Cucujus) testaceus, Steph. (nec Fabr.).

I have not been able to ascertain on what authority *L. testaceus*, Fabr., is placed in Masters' Catalogue, and therefore I am, of course, unable to state positively that the German insect has not been found in Australia, but I should think it very improbable.

CLERIDÆ.

NATALIS.

N. hirta, sp. nov. Angusta; subcylindrica; pilis sat longis erectis dense vestita; ferruginea; oculis fortiter convexis, minoribus; elytris antice minus fortiter (postice gradatim subtilius) cancellato-punctulatis, interstitiis antice latis planatis alternis mox pone basin gradatim angustioribus carinatis. Long., 9 l.; lat. $2\frac{1}{5}$ l.

A narrow convex species thickly clothed with erect hairs over the whole upper surface and the legs. The elytra are very peculiarly sculptured. The punctures in the rows are much smaller than in *N. porcata*, Fab., the interstices between the rows of punctures being even at the base quite as wide as the individual punctures in the rows; at the extreme base all the interstices (though flat) are a little raised, but at a very short distance behind the base the alternate interstices disappear altogether (or—more exactly—cease to be in the least degree elevated) while the others become narrower and more cariniform; in the apical half the sculpture of each elytron consists of four costæ (exclusive of the suture and the lateral margins), close to which on either side is a row of square punctures—the space between the first and second rows being perfectly flat, and not in the least elevated, that between the second and third strongly costate, and so on. The head and prothorax are very similar to those of *N. semicostata*, Blackb. (the latter being evidently wider, and more dilated later-

ally behind the middle than in *N. porcata*), but the antennal club does not differ notably from that of *N. porcata*. The ventral segments (of the example before me) are nitid throughout, and have a double system of puncturation (except on the broad riband-like band which forms the apical portion of the anterior four segments) consisting of a very fine, even, close puncturation, among which much coarser and somewhat squamose punctures are rather evenly but not closely mingled. The apical margin of the fifth ventral segment is very feebly bisinuate. The femora do not differ noticeably from those of *N. porcata*; the anterior and intermediate tibiæ are arched, the hind tibiæ straight.

W. Australia; Israelite Bay (Mr. French).

N. spinicornis, sp. nov. Elongata; sat plana; minus pubescens; ferruginea, antennis (clava excepta) capite prothorace, et corpore subtus obscurioribus; oculis sat magnis minus convexis; antennarum articulo ultimo intus apice spina valida producto, articulis penultimis fortiter transversis; prothorace subcylindrico obsolete punctulato ad latera parum ruguloso, quam latiori vix longiori; elytris apice mucronatis, crassissime cancellato-punctulatis, puncturis apicem versus obsoletescentibus, interstitiis plerisque postice carinatis; femoribus posticis gracilibus, valde elongatis. Long., $9\frac{1}{2}$—$11\frac{3}{5}$ l.; lat., $2\frac{2}{5}$—$3\frac{1}{5}$ l.

A very remarkable species, and very distinct from all previously described. The elytra gradually and gently increase in width from the base hindward to about the middle, and then dilate almost suddenly to half again the width of their base. In the two examples before me (probably of the same sex) the ventral segments are somewhat closely and by no means finely squamose-punctulate, with some much finer puncturation intermingled, the puncturation being finer, closer, and less squamose about the middle (and especially near the apex) of the intermediate three segments. The apical margin of the fifth ventral segment is subtruncate and scarcely bisinuate. The front and intermediate tibiæ are moderately arched, the hind tibiæ straight. Of the elytral interstices all except the first and fifth are more or less carinate behind. The interstices are near the base very much narrower than the individual punctures in the rows.

S. Australia; near Adelaide.

N. lugubris, sp. nov. Elongata; minus convexa; minus pubescens; piceo-nigra, capillis aureis hic illic (præsertim in femorum anticorum parte inferiori, in tibiarum apice intus, et in tarsis subtus) conspicue ornata; oculis sat magnis modice convexis; antennarum articulo ultimo subferrugineo sat lato apice oblique subtruncato, 10° manifeste (9° nullo

modo) transverso; prothorace quam longiori parum latiori, subcylindrico, obscure punctulato, ad latera minus ruguloso; elytris crassissime cancellato-punctulatis, puncturis in tertia partia apicali subobsoletis, interstitiis alternis postice fortiter carinatis; femoribus posticis sat gracilibus sat elongatis. Long., 12 l.; lat., $3\frac{2}{5}$ l.

This species cannot be far removed from the preceding one, which it resembles in the prothorax being only a little tumid laterally behind the middle, and in the hind femora being more slender and elongate (though not nearly so much in this species) than in *N. porcata* and others. The elytra are sculptured almost exactly as in *N. semicostata*, Blackb., but are very much less dilated behind the middle than in that species (which moreover has much shorter hind femora and straight intermediate tibiæ, smaller and more prominent eyes, shorter tarsi, &c.). In the example before me the longitudinal channel on the prothorax is very short indeed, but (judging from other species) it is probably variable. The ventral segments are very like those of *N. semicostata*, the middle of the second and third being opaque through the presence of very close minute puncturation (in this species, however, not pubescent, as in *semicostata*), and the apex of the fifth being distinctly bisinuate. The front and middle tibiæ are strongly curved, the hind tibiæ straight.

McDonnell Ranges, Central Australia; taken by Mr. A. S. Wild.

N. constricta, sp. nov. Minus angusta; parum convexa; pilis sat longis erectis dense vestita; elytris ad basin quam prothorax sat angustioribus postice fortiter dilatatis; ferruginea; capite, prothorace, femorum parte media, sternis, et abdominis lateribus plus minus infuscatis; elytris postice rotundatis, puncturis quadratis sat magnis seriatim instructis, interstitiis alternis sat fortiter elevatis. Long., 6 l.; lat., 2 l

The head and prothorax are closely covered with fine puncturation with more sparse and much coarser punctures intermingled, the sides of the latter not very coarsely rugulose; the sculpture of the prothorax is in all respects very similar to that of *N. porcata*, Fab., but the segment is shorter, its length and width being equal. The extreme narrowness of the elytra at the base (where they are only about seven-tenths of their width near the apex and are decidedly narrower than the prothorax) at once separates this little species from its described congeners. The front and intermediate tibiæ are strongly arched.

Central Australia.

N. inconspicua, sp. nov. Elongata; sat convexa; postice parum dilatata; pilis longis erectis dense vestita; ferruginea,

capite prothorace sternisque plus minus infuscatis ; elytris apice rotundatis, puncturis quadratis seriatim instructis interstitiis vix elevatis. Long., $5\frac{2}{5}$—6 l. ; lat., $1\frac{2}{3}$—$1\frac{4}{5}$ l.

The sculpture of the head is close and confused, consisting of large and small punctures and numerous stria-like wrinkles much mixed together ; that of the prothorax (which is distinctly longer than wide) is almost as in *N. porcata* but much less rugulose on the sides. The rows of punctures on the elytra are almost as in *N. porcata ;* the interstices between the rows of punctures are almost flat, the alternate interstices however from some points of view appearing not quite so flat as the rest.

The long, closely set, erect hairs clothing the whole surface and the legs will at once distinguish this species from nearly all its described congeners. It differs from *N. hirta* by the absence of elytral carinæ and from *constricta* by the elytra much wider than the prothorax, the prothorax longer than wide, &c., &c.

S. Australia ; I do not know the exact habitat.

N. fasciata, sp. nov. Sat elongata ; minus convexa ; minus pubescens ; ferruginea vel ferrugineo-picea elytris mox post medium obscure pallide fasciatis, oculis sat magnis modice convexis ; antennarum articulo ultimo sat elongato apice obtuse acuminato, 10° manifeste (9° vix evidenter) transverso ; prothorace quam longiori haud latiori, subfortiter minus crebre duplo-punctulato, lateribus pone medium sat fortiter rotundato-ampliatis, parte ampliata crassissime rugulosa ; elytris crasse cancellato-punctulatis, puncturis postice obsoletescentibus, interstitiis alternis postice plus minus carinatis ; femoribus posticis minus gracilibus minus elongatis. Long., 8—$10\frac{1}{2}$ l. ; lat. $2\frac{1}{2}$—$3\frac{1}{5}$ l.

This species is near *N. porcata*, Fab., from which it differs *inter alia* in the strong lateral dilatation of the prothorax behind the middle, in the much greater prominence of the alternate interstices of the elytra as compared with the other interstices in the hinder part, in the presence of a distinctly apparent (though faint) fascia of a pallid colour running across the elytra immediately behind the middle, and in the puncturation of the ventral segments, which is of two different systems, one consisting of fine close punctures, the other of rather closely packed strong squamose punctures—much as in *N. hirta*. The puncturation on the prothorax also consists of fine and coarser punctures intermingled, but it should be noted that this puncturation is much less close and rugulose than on the prothorax of *N. cribricollis*, Spin. In one of the examples before me the fifth ventral segment is quite strongly, almost semi-circularly, emarginate all across its apical border ; in the other example this segment is sub-bisinuately

truncate (the bisinuation scarcely indicated). The front and intermediate tibiæ are strongly bent.

N.B.—A third example—apparently immature—is entirely of a pale testaceous colour with the fascia scarcely indicated on the elytra.

S. Australia ; near Port Lincoln.

N. longicollis, sp. nov. Elongata ; minus convexa ; capillis longis dispersis vestita ; ferruginea ; oculis sat magnis sat convexis ; antennarum gracilium articulo ultimo sat elongato apice obtuse acuminato, 10° manifeste (9° vix evidenter) transverso ; prothorace quam latiori sat longiori, subfortiter minus crebre duplo-punctulato, lateribus pone medium modice rotundato-ampliatis, parte ampliata sat crasse rugulosa ; elytris crasse cancellato-punctulatis, puncturis postice minoribus, interstitiis alternis postice leviter carinatis ; femoribus posticis sat gracilibus sat elongatis. Long., $6\frac{2}{5}$ l. ; lat., $1\frac{4}{5}$ l.

Resembles *N. fasciata* but with unicolorous elytra, antennæ much more slender, prothorax decidedly longer than broad and less dilated laterally behind the middle (in the example before me the longitudinal channel on this segment is placed in a large deep depression), the hind femora much longer and more slender, &c. From *N. cribricollis*, Spin. (of which Dr. Sharp kindly identified an example for me), this species differs by its much less closely punctured prothorax. The general puncturation of the ventral segments is sparse squamose and rather coarse ; but the middle of the third and fourth of these segments is occupied by very strong, rather fine, and very closely packed punctures. The apical margin of the fifth ventral segment is truncate.

S. Australia ; near Adelaide.

SYNOPSIS OF SPECIES.

A. Species of moderate size or small (not more than about an inch long).
  B. Apex of elytra not mucronate.
    C. Body above and legs not clothed with long close erect pilosity*
      D. Disc of prothorax not closely and evenly punctured.
        E. Intermediate tibiæ bent.
          F. Sides of prothorax very strongly vermiculate rugulose.
            G. Alternate interstices of the elytra much more costate than the rest.
              H. Prothorax gently transverse. *lugubris*, Blackb.
              HH. Prothorax not wider than long. *fasciata*, Blackb.

GG. Alternate interstices of elytra not or scarcely more elevated than the rest. *porcata*, Fab.

FF. Sides of prothorax much less rugulose than in *N. porcata, fasciata*, &c. *longicollis*, Blackb.

EE. Intermediate tibiæ straight. *semicostata*, Blackb.

DD. Disc of prothorax closely and evenly punctured. *cribricollis*, Spin.

CC. Body above and legs clothed with close, erect, long pilosity.*

D. Elytra wider at base than the prothorax.

E. Elytra with strong widely separated carinæ behind the middle. *hirta*, Blackb.

EE. Elytra with no distinctly cariniform interstices. *inconspicua*, Blackb.

DD. Elytra narrower at base than the prothorax. *constricta*, Blackb.

BB. Apex of elytra mucronate. *spinicornis*, Blackb.

AA. Species of great size. *Titana*, Thoms.

N.B.—Besides the above there is Sir W. Macleay's *N. Mastersi* (from Queensland), the description of which is not complete enough to enable me to place it in the tabulation. It seems, however, to be near my *fasciata*, but to have unicolorous elytra and the prothorax "much longer than wide."

CISSIDÆ.

CIS.

C. æqualis, Blackb. I accidentally omitted to add to my description of this species (Trans., 1887, p. 268) the mention of the fact that the insect is found in hard fungi on trees near Port Lincoln.

LONGICORNES.

ENNEAPHYLLUS.

E. Rossi, sp. nov. ♂ Minus elongatus, postice leviter angustatus; sat nitidus; ferrugineus, mandibulis nigris, antennarum articulis basalibus et prothoracis lateribus picescentibus; elytris crasse punctulatis, obscure subcostatis; antennis corpore sat longioribus, articulis 3-10 ramas singulas minus elongatas emittentibus; segmento ventrali 5° apice arcuatim emarginato; oculis supra minus approximatis; corpore subtus pallidiori. Long., 13 l.; lat., $4\frac{2}{5}$ l.

* Most species of the genus have a clothing of short semi-recumbent hairs mingled with a few long and erect, but this is quite different from the long close pilosity of the species included under "CC."

Resembles *E. æneipennis*, Waterh.; compared with that species the general form is less elongate, and the elytra are more narrowed hindward. The elytra are much more coarsely punctulate, and the lamelliform processes of the antennal joints are much shorter, that of the third joint being scarcely longer than the fourth joint, those of the following joints increasing a little, but not one of them exceeding double the length of the joint from which it is given off.

Victoria; in the mountainous districts near Tarwin River in South Gippsland. Sent to me by Mr. C. French, and named (at his wish) in honor of the captor, Mr. Ross.

CERAMBYX PULLUS, *Newm.*

I believe this name to have crept into Masters' "Catalogue of Australian Coleoptera" by an oversight. Newman states that it is from New Zealand.

PACHYDISSUS.

P. boops, sp. nov. Nigro-piceus; sat dense griseo-sericeo pubescens; prothorace ad latera obtuse tuberculato, supra crasse rugato; elytris apice emarginatis, incisuræ angulis productis spiniformibus; subtus oculis sat approximatis, spatio inter oculos fortiter sat æqualiter punctulato vix leviter impresso haud transversim sulcato.

Maris antennis corpore paullo brevioribus; articulo 1° turbinato prothoracem nullo modo attingenti; 2° perbrevi fortiter transverso; 3° quam 1us vix breviori, fortiter turbinato, qnam latiori sat longiori; 4° quam 3us manifeste nec multo breviori, vix angustiori, turbinato, quam latiori parum longiori; 5° 3° longitudine æquali, hoc sat angustiori, leviter turbinato; 6° multo angustiori, vix turbinato, quam 1us parum longiori: ceteris simplicibus; segmento ventrali apicali postice bisinuato.

Feminæ (? hujus speciei) antennis usque ad segmentum ventralem 3um haud plane attingentibus, haud dilatatis; segmento ventrali apicali postice rotundato. Long., 14—15 l.; lat., 4—5 l.

The species of this genus are very difficult to separate *inter se* owing to the sculpture and pubescence of their upper surface being very uniform. The present species is very like *P. sericus*, Newm., from which it differs by the antennæ of the male having their dilated joints more strongly swollen and differently proportioned, and notably by the structure of the head, which appears to me to furnish the best specific characters in this genus. The eyes are a trifle more approximate above than in *P. sericus*, the interval between them being distinctly less wide in the male than the

length of the shortest line that can be drawn across the eye at its narrowest point (behind the antennæ). On the underside the eyes are much more approximate than in *P. sericus*. If the insect be turned upside down, so that the undersurface of the head is looked down upon, the width of the interval between the eyes is distinctly less than the width of the visible portion of either eye. The portion of the head between the eyes (on the undersurface) is evenly and somewhat closely and strongly punctulate, and bears a shallow impression near its front. In *P. sericus* the portion between the eyes of the undersurface of the head is distinctly wider than the width of the visible portion of either eye (similarly looked down upon), is not distinctly punctured, and bears an extremely deep transverse sulcus. The presence of this sulcus makes the front and hind margins of the same appear as two strong parallel costæ, so that from a certain point of view (looking from in front obliquely along the undersurface of the head) these two and the front margin of the submentum appear to be three strong parallel nitid ridges (almost like knife-edges). There is no such appearance on the undersurface of *P. boops*.

South Australia; basin of Lake Eyre.

P. Tatei, sp. nov. Nigro-piceus; sat dense griseo-sericeo pubescens; prothorace ad latera obtuse tuberculato, supra crasse rugato; elytris apice truncato-emarginatis, incisuræ angulis vix acutis; subtus oculis valde separatis, spatio inter oculos crasse sparsim obscure punctulato transversim manifeste concavo.

Maris antennis corpore multo brevioribus, præter modum dilatatis; articulo 1° ovato quam latiori parum longiori, 2° perbrevi quam longiori quater latiori, 3° 6° singulis 1° longitudine subæqualibus, 3° 4° que fortiter transversis, 5° paullo angustiori vix transverso, 6° quam 5us sat angustiori quam latiori paullo longiori, 7° paullo longiori minus incrassato; ceteris simplicibus, segmento ventrali apicali postice leviter bisinuato.

Fem. latet.

This is one of the most remarkable *Longicorns* known to me, owing to the extraordinary shape and thickness of the antennæ in the male, which remind one of the horns of an ibex. At their widest part they are scarcely narrower (placed side by side) than the prothorax. The interval between the eyes on the upper-surface is considerably wider than the length of the shortest line that could be drawn across the eye behind the antennæ. The portion between the eyes on the undersurface is extremely wide, scarcely narrower than the widest part of the buccal cavity. In shape this piece of the undersurface of the head is not unlike that of *P. sericus*, Newm., but is wider and much less strongly sulcate

transversely. Its front edge is nitid and somewhat prominent, so that viewed from a point similar to that from which the undersurface of the head in *P. sericus* presents three transverse nitid ridges, the front of the submentum and of the piece between the eyes appear as two nitid ridges (the hindmost one of *P. sericus* appearing to be wanting). The feeble emargination of the apex of the elytra and the non-spiniform extremities of the same are also distinctive. From *P. boops* this insect is at once distinguished *inter alia* by the much wider separation of its eyes both above and beneath, and by its wonderful antennæ.

I have named this species after Prof. Tate, who has proved the singular versatility of his abilities in Natural History by discovering this and others of our most interesting Australian *Coleoptera*, in spite of his having treated the *Coleoptera* as quite a subordinate object of study.

South Australia ; near Eucla.

N.B.—I have before me examples of all the described Australian species of this genus. *P. Australasiae*, Hope, is distinguished *inter alia* by the antennæ of the male being much longer than the body ; the structure of the head and eyes is almost as in *P. boops*. *P. picipennis*, Germ., has the antennæ of the male a little longer than the body, and the head and eyes very similar to those of *P. Tatei*, although on the undersurface the front margin of the piece between the eyes is much less prominent in an upward direction. *P. nubilus*, Pasc., has antennæ more feebly dilated in the male than in *P. sericus*, the structure of the head resembling that of *P. boops*, but with the eyes separated a little more widely above and much more widely beneath.

DIDYMOCANTHA.

D. nigra, sp. nov. ♀ (?) Elongata; nitida; nigra; femoribus basi rufis ; antennis obscure rufis (articulis 1° omnino, 3° et sequentibus apicem versus, picescentibus); his corpore paullo minus dimidio brevioribus, nitidis, setis subtilibus elongatis sparsim vestitis, articulo 1° sat incrassato fortiter (ceteris subtiliter) punctulato quam 7us vix longiori, 2° minuto, 3° omnium longissimo, 4° quam 3us parum breviori, ceteris gradatim parum brevioribus, articulis 4-10 leviter compressis apice intus sat productis nec spinosis ; prothorace quam longiori fere duplo latiori, crebre fortiter confluenter rugulose punctulato, in medio longitudinaliter irregulariter lævi, pilis sat brevibus erectis sparsim vestito, nec tuberculato nec spinoso, lateribus minus arcuatis mox pone apicem et ante basin constrictis ; elytris fortiter sat crebre vix rugulose punctulatis singulis leviter bicostatis apice rotundatis ; pedibus modicis sparsim setosis, femoribus posticis abdominis longitudinem mediam vix

attingentibus ; oculis magnis reniformibus fortiter granulatis supra subapproximatis, subtus distantibus ; palpis maxillaribus labialibus sat longioribus. Long., 11 l. ; lat., 3 l.

The irregular lævigate central line of the prothorax widens out just behind the middle into a somewhat quadrate space which is scarcely elevated above the general surface. The shape of the prothorax is a little difficult to describe ; this segment is almost equally wide at the base and apex, but immediately behind the apex and in front of the base it suddenly dilates, the sides of this wider portion being scarcely rounded, but diverging slightly hindward. The sculpture of the prothorax and the somewhat elongate (as compared with the 4th) third joint of the antennæ are perhaps hardly consistent with a place in *Didymocantha*, but I do not find any other inconsistent characters.

Yilgarn, W. Australia ; sent to me by C. French, Esq.

DEMONASSA MACLEAYI, *Pasc.*

There can hardly be a doubt that this is identical with *Lamia dichotoma*, Newm. ; as the latter is the older name the synonomy will stand thus :—

Demonassa dichotoma, Newm. Zool. App., 1851, p. 179 [*Lamia (Symphyletes)*].
D. Macleayi, Pasc. Trans. Ent. Soc., 1859., p. 32 *(Zygocera)*.
D. funeraria, Thoms. Syst. Ceramb., 1864, p. 328.

SYMPHYLETES.

S. modestus, sp. nov. Obscure ferrugineus, pube grisea umbrina aurantiacaque vestitus; prothorace antice angustato, supra bituberculato ; elytris sat elongatis, distincte punctulatis, apice subemarginatis dense hirsutis, parte antica fere dimidia (præsertim latera versus) sparsim sat fortiter granulatis. Long. 7 l. ; lat., $2\frac{2}{5}$ l.

The derm is of a dull ferruginous, or neutral, tint, becoming a little brighter in the hinder half of the elytra and on the underside. The labrum is almost testaceous. The vestiture of the face consists of a dense mixture of rather long fulvous and grey pubescence. On the top of the head and on the prothorax the pubescence is dark-brown, mottled with orange. On the elytra a common triangular space (limited by the base and a line from each shoulder to a point on the suture situated at a distance from the base equal to a little more than a quarter of the length of the suture) is concolorous with the prothorax, or even a little darker ; immediately behind this, on each elytron, another space (indefinedly triangular, limited behind by a line running from the suture at the apex of the dark basal common triangle to the lateral

margin a little in front of its middle) is clothed with pale-grey pubescence very conspicuously mottled with orange; the remainder of the elytra is clothed with ferruginous pubescence obscurely marked with greyish patches and numerous small but conspicuous and well-defined orange spots. On each elytron there are about 20 shining black pointed granules of moderate size placed almost entirely on the pale triangular patch, and running somewhat irregularly in about five longitudinal rows. The prothorax is about one-third again as wide as long, widest at the base, and narrowed to the front, the sides not toothed, and almost straight. The undersurface is clothed with whitish pubescence, the sides of the metasternum, the hinder part of each ventral segment, and various small spots being orange. The pubescence of the legs is for the most part brownish or fulvous, but it is whitish-grey on the undersurface of the femora. My example is a male; its anterior coxæ are not spined; its second ventral segment has on either side a large patch of dense silky pubescence (of pale-brown colour) as in *pubiventris*, Pasc. The antennæ are scarcely longer than the whole body; they are clothed with ferruginous pubescence, the extreme base and undersurface of the joints whitish, the undersurface with a close-set fringe of long pale-brown hair.

South Australia; Port Lincoln district.

PLATYOMOPSIS.

P. Frenchi, sp. nov. Picescens; pube cinerea et fumicolori dense vestita; prothorace tuberculis circiter 8 vix pone medium serie transversali positis; elytris apice truncatis, tuberculis numerosis (longitudinaliter seriatim dispositis) instructis, his pone partem basalem apicem versus gradatim minoribus, pube fumicolori humeros apicemque versus disposita et maculam subrotundam fere nigram in medio marginis lateralis formanti. Long., 7 l.; lat., $2\frac{4}{5}$ l.

The close-set pubescence covers the whole surface so densely that the derm (excepting the nitid tubercles) is entirely concealed. The general colour is ashy white, with a slightly ferruginous tone on the head and sterna. The appearance of markings caused by the presence of smoky-coloured pubescence takes the form of an ill-defined patch on the shoulder, a large well-defined spot on each side at about half the length of the elytra (round about which the whitish pubescence is at its whitest), and a large obscure apical patch, the front margin of which slopes away hindward on either side from the suture just behind its middle, reaching the lateral margin at a distance from the apex of about a third of its whole length. The row of eight small tubercles (of which the middle two are the largest, they only projecting above the pubescence), placed in a sinuous line, with its ends near the front

margin of the prothorax on either side, and its middle at about the centre of that segment, together with the disposition of the elytral tubercles, will distinguish this species from its described congeners. The elytral tubercles are smaller than in the allied species. In the hinder third part of the elytra they do not rise above the pubescence; they run in six or seven fairly regular longitudinal lines on each elytron (the first, third, and fifth rows containing the largest tubercles), and in each row no tubercles behind the front quarter of the elytra are nearly so large as some of those on the front quarter. The straight truncation (with its external limit not at all spiniform) of the apex of the elytra also seems to be a good character.

Yilgarn, W. Australia; sent to me by C. French, Esq.

PHYTOPHAGA.

POLYOPTILUS.

I believe *P. Lacordairei*, Germ., and *P. Erichsoni*, Germ., to be the male and female respectively of one species. My reasons for thinking so are that the two always seem to occur in company, and that all the examples I have dissected of the former are males and of the latter females. The principal difficulty that I see in the way of this conclusion is the existence of an insect which is described by Mr. Baly (Cist. Ent. II. p. 46) as the female of *P. Lacordairei*, of which I have an apparently identical example before me (its antennæ unfortunately have been broken off). This latter is very like *P. Lacordairei* ♂ and moreover is a female; its elytra are abbreviated and are dehiscent behind and its hind femora are unarmed. The armature of the hind femora however is certainly not a reliable sexual character as I possess ♂ examples of a species (described below) with unarmed femora —nor is the abbreviation of the elytra indicative of sex as the examples of *P. Erichsoni* before me are all females and all have fully developed elytra. I doubt whether the example with short elytra is *P. Lacordairei*—if it is I should take it to be an aberration—but I find that its prothorax is differently shaped, having its greatest width manifestly nearer to the middle than in *P. Lacordairei*, and moreover it comes from New South Wales where I am not sure that the latter species occurs. Some years ago I found a great number of *P. Lacordairei* and *Erichsoni* (*Lacordairei* much the more plentiful) promiscuously under stones near Port Lincoln, but there were no examples with shortened elytra among them. It is of course a possibility that my example with shortened elytra is not specifically identical with that described by Mr. Baly. As far as my observations go—I have dissected only the two forms described by Germar and the example with shortened elytra—the females of this genus, as

compared with the males, are in general stouter and more robust with the antennæ and tarsi less slender and elongated—and have the hind body much less pubescent, the outline of the latter from the hind coxæ to the apex (viewed from the side) being straight or somewhat convex, while in the males it is concave.

P. gracilis, sp. nov. ♀ Angustus; elongatus; pubescens (elytris glabris exceptis); niger vel nigro-piceus, elytris fulvis maculis nigris notatis, antennis capite prothorace et pedibus (femoribus, nisi basin versus, piceis exceptis) plus minus rufescentibus; antennis gracilibus, corpore vix brevioribus; capite prothoraceque confertim minus fortiter punctulatis; elytris vix striatis, obscure lineatim punctulatis, interstitiis hic illic longitudinaliter subcarinatis, femoribus posticis inermibus; pedum intermediorum tarsis quam tibiæ sat longioribus. Long., $4\frac{1}{2}$ l.; lat., $1\frac{1}{5}$ l.

The pitchy black markings on the elytra are all longitudinal, and are placed as follows:—Three (the middle one on the suture) running from the base a short distance hindward, one on each elytron (beginning between the hinder part of the sutural and external anterior marks) reaching to considerably behind the middle, one close to the external margin behind the shoulder, and three or four placed side by side between the hinder part of the elongate juxta-sutural mark and the lateral margin.

Compared with *P. Lacordairei*, the antennæ are considerably more slender than in that species; the prothorax is pubescent, narrower, its greatest width nearer the middle, a little flattened, more strongly and very much more closely punctured; the femora unarmed; the tarsi (especially the intermediate) longer and more slender, the elytra not distinctly striate in any part but with the interstices between the rows of punctures distinctly subcarinate here and there. The unarmed hind femora will separate the present species from all previously described in the genus unless it be *pachytoides*, Baly, the hinder femora of which are uncharacterised—but that species differs from the present one *inter alia* in having the surface of the prothorax "rugose, coarsely punctured."

S. Australia; near Adelaide, &c.

P. robustus, sp. nov. ♂ Sat elongatus, postice angustatus; piceus vel rufopiceus, antennis palpis pedibusque rufescentibus, elytris rufis vel testaceo-rufis maculis nigris notatis; antennis minus gracilibus corpore vix brevioribus; capite crebre fortiter, prothorace sat fortiter minus crebre, punctulatis; elytris fortiter punctulato-striatis, interstitiis vix convexis sat fortiter punctulatis, striis apicem versus obsoletis; femoribus posticis in medio late obtuse dentatis, paullo ante

apicem dente valido curvato armatis ; pedum intermediorum tarsis quam tibiæ vix longioribus. Long., 4½ l. ; lat., 1½ l.

In the two examples before me the elytra bear a black blotch on the lateral margin close to the base and also a large basal spot of the same colour which includes the scutellum, and sends off several black lines running hindward, and in both examples the suture is black ; in one of them the lateral margin is narrowly piceous, and each elytron bears a large elongate, irregular, black blotch, commencing a good deal in front of the middle and reaching a good deal behind the middle, almost touching the suture and well separated from the lateral margin, and also a smaller black spot near the apex ; in the other example there is only one black spot (besides those near the front), which commences at the middle and reaches thence about half way to the apex, and the lateral margin is scarcely infuscate. This species seems to be distinguished from all previously described by the following characters in combination :—Prothorax not longer than wide, elytra strongly punctulate-striate with interstices punctured scarcely less strongly than the striæ. The antennæ scarcely differ from those of *P. Lacordairei ;* the prothorax is at its widest much nearer the middle that in that species ; the elytra are less parallel, being gently narrowed hindward from the base.

S. Australia ; I am not sure of the exact locality, but believe it to be in the Northern Interior.

PARACADMUS.

P. lucifugus, Baly. I have received from Mr. Froggatt, of Sydney, a specimen (said to be from the south of New South Wales) which is certainly, I think, this species—stated by its author to be from "Australia" without more exact mention of habitat. The example before me differs from the description—a very full one—in the following particulars, none of which could rightly be regarded as justifying specific separation—it is a little larger (long. 3 l., instead of 2½ l.), the intermediate femora (not the hind only) are whitish beneath, the prothorax (which is said to have in the type a few small, indistinct, obscurely fulvous spots on either side of the "hinder disc") has an interrupted flexuous fulvous line running forward from the base on either side, and gradually becoming indistinct towards the front ; the front angles of the prothorax do not to my eye appear to be "curved slightly outward," the elytra behind are somewhat more than "obsoletely" costate, and the dark mark on the second and third ventral segments is wanting. There appears to be little doubt that *P. lucifugus*, Baly, is *Cadmus luctuosus*, Chp. ; the latter name being of prior date, the insect should be called *Paracadmus luctuosus*, Chp.

P. maculatus, sp. nov. Sat elongatus; subtus pallide albo-flavus ;

pedibus (femoribus et tibiarum basi summa flavis exceptis) et antennis (articulis 6-9 flavis exceptis) nigris; supra niger; clypeo, labro, prothoracis marginibus (basi excepta) et utrinque vitta lata antice abbreviata, in elytris singulis maculis discoidalibus 3 longitudinaliter positis (maculis intermediis quam ceteræ majoribus), et elytrorum margine reflexo antice, læte flavis; capite creberrime rugulose subtilius, prothorace elytrisque crassissime rugulose, punctulatis; his postice subcostatis; antennis corpore sat longioribus. Long., $2\frac{1}{3}$ l.; lat., $1\frac{1}{5}$ l.

Australia; exact habitat unknown; a single example in the South Australian Museum.

PRIONOPLEURA.

P. crucicollis, Boisd. This is an extraordinarily variable species. I have before me a series which I obtained all together by sweeping *Eucalyptus*, and which unite *P. flavocincta*, Saund., with it, and go even beyond that variety to a form having the elytra almost entirely black, each bearing a large yellow spot. This latter* placed beside an ordinary specimen looks as if its markings are *essentially* different, but intermediate forms differ from typical *crucicollis* through a series in which the first departure varies only by the portion of the elytra lying between the two transverse series of black marks being slightly paler than the rest of the surface, and this pale portion in other specimens becomes still more conspicuous, and finally yellowish and bright yellow, while the black marks correspondingly unite together and overspread the part of the surface that is not yellow.

Cadmus cinnamomeus, Suff., is given by Gemminger and Harold as the female of *P. flavocincta*, Saund. I have never seen a specimen quite agreeing with Suffrian's type, which should have no markings at all on the prothorax, and therefore I am perhaps hardly justified in expressing a decided opinion, but it seems to me very probable that this also is a variety of *crucicollis*.

P. erudita, sp. nov. ♀ Minus elongata; subquadrata; supra ferruginea; capitis vertice et linea longitudinali antice bifurcata, prothoracis macula literam U simulanti et utrinque maculis aliis indeterminatis, scutello, et elytrorum maculis nonnullis fascias 2 (alteram pone basin alteram pone medium) interruptas formantibus, nigris vel nigro-piceis; corpore subtus pedibusque læte flavis, metasterni macula triangulari, femoribus tibiisque maculatim et tarsis, nigris; antennis gracilibus rufis, articulis basalibus 2 ultimoque nigris;

* Probably *Cadmus bimaculatus*, Dey. (never, I think, formally described), which Suffrian speaks of as a var. of *flavocincta*.

scutello puncturis nonnullis instructo, haud carinato ; elytris sat crasse punctulatis, antice vix manifeste (postice sat evidenter) longitudinaliter costatis. Long. $2\frac{4}{5}$ l. ; lat., $1\frac{3}{5}$ l.

The prothorax is more gibbous than is usual in the genus ; it has no dorsal channel, and is coarsely sculptured ; the dorsal mark resembling the letter U does not quite reach either the base or apex. The species should be placed among those with non-costate elytra, although there are distinct traces of costæ near the apex, one or two of which appear from some points of view to run forward a little further than the rest. The markings on the elytra are very much as in *C. histrionicus*, Chap., or a typical example of *C. crucicollis*, Boisd. From the latter of these the non-costate elytra furnish a good distinction, from the former the slender antennæ, which are a little longer than two-thirds of the body.

South Australia.

P. suturalis, sp. nov. ♂ Minus elongata ; minus convexa ; testaceo-ferruginea ; capite (parte circa oculos excepta), prothoracis macula media longitudinali et nonnullis utrinque minoribus, scutello, elytrorum sutura humerisque, antennis (articulis 2-5 exceptis), metasterni macula media triangulari, femoribus subtus et supra, tarsorumque articulis ultimis 2, nigris ; antennis corpori longitudine æqualibus ; prothorace ad latera fortiter denticulato ; scutello longitudinaliter fortiter carinato, opaco (carina marginibusque nitidis exceptis), crasse ruguloso ; elytris confuse sat fortiter punctulatis. Long., 3 l. ; lat., $1\frac{4}{5}$ l.

♀ Multo magis convexa, antennis corpore multo brevioribus rufis (articulo 1° excepto), elytris maculis nigris sat numerosis ornatis.

A male *Prionopleura* in the South Australian Museum (habitat unknown) seems to be referable to this species, although its antennæ considerably longer than those of the type, and the absence of a black humeral spot on the elytra may possibly indicate a new species.

South Australia ; near Port Lincoln.

The only species previously described as presenting the combination of non-costate elytra with a prothorax strongly crenulate on the sides are *P. cognata*, Saund., 4-*tuberculata*, Suff., *histrionica*, Chap., and *rugicollis*, Gray. Of these, the former two are said to be the sexes of a single species, the male of which (4-*tuberculata*) differs from the present species *inter alia* by its pallid antennæ and tubercled elytra, the female (*cognata*) by its very different markings, yellow scutellum, &c. ; while *histrionica*, Chap., may be at once distinguished from it by the strongly com-

pressed apical joints of its antennæ, and *rugicollis* by its male having red antennæ. *P. salebrosus*, Guér., is described as entirely devoid of markings on the upper surface. *P. trispilus*, Chap., has the prothorax laterally denticulate and the elytra "*obsoletissime costata*," but even if the latter character represent a costation scarcely distinguishable from none at all, the antennæ, prothorax, and elytra are all described as quite differently coloured from those of the present species. All the other described species of *Prionopleura* are stated by their authors to have costate elytra or the prothorax non-denticulate, or both.

CHALCOLAMPRA.

C. rustica, sp. nov. Sat elongata; haud parallela; ænea, antennis palpisque testaceis, pedibus obscure rufis (femoribus paullo æneo-micantibus); prothorace duplo-punctulato; elytris subtiliter punctulato striatis, interstitiis planis crebre minus subtiliter punctulatis. Long., $2\frac{1}{2}$ l.; lat., $1\frac{3}{5}$ l.

The third joint of the antennæ is more than half again as long as the fourth. Compared with the common *C. ænea*, Boisd. (*acervata*, Germ.), the following points of difference may be noted (apart from colour):—The antennæ are very much more slender, the prothoracic punctures of the larger system are much smaller and less coarse, the prothorax is wider (being very fully twice as wide as long), and is narrower as compared with the elytra (which, at their widest, are more than half again as wide as it), the punctures in the elytral striæ are finer and much more closely placed, and the interstices of the elytra are more perfectly flat and are closely punctured. Of the previously-described species of *Chalcolampra* not differing from this one so conspicuously as to make comparison superfluous, *C. Hursti* has distinctly convex elytral interstices; *laticollis* and *simillima* have the prothorax as wide as the elytra; *parallela* has the elytra parallel (in this species they are oval), and *luteicornis* and *Adelaidæ* have the prothorax of equal width with the base of the elytra to which they are very exactly fitted (in this species the base of the elytra is considerably wider than the base of the prothorax).

Yilgarn, W. Australia; sent to me by C. French, Esq.

CALOMELA SEXMACULATA, *Jac.*

This species is stated in Masters' Catalogue to occur at Rockhampton, Queensland. On turning up the only reference given (E.M.M., 1885, p. 224), the habitat is found to be there entered as "Point Moresby, New Guinea." I suspect the name has found its way into the Australian Catalogue by an oversight.

P. gibbosa, sp. nov. Ovata; in medio fortiter gibbosa; rufa, maculis albis elevatis numerosissimis ornatis; crasse rugulose sat crebre punctulata; prothoracis lateribus leviter arcuatis apice sat mucronatis. Long., 5½ l.; lat., 3⅕ l.

The gibbosity is so placed that (the insect being viewed from the side) the highest point is slightly in front of the middle of the elytra, but slightly behind the middle of the whole body, and that the height of the insect at that point is greater than half the length of the elytra. The colour is a decided red, with the antennæ-palpi and legs somewhat pallid, and the whole upper surface marked with ivory-like yellowish-white, as follows:—The labrum, six blotches on the head, the lateral and anterior margins and a number of indeterminate blotches on the prothorax, the scutellum, the anterior and lateral margins, and a great number of small blotches on the elytra and the tarsi. The puncturation of the whole upper surface is strong and rugulose; it is coarsest and least close on the elytra, closest and least coarse on the head. The puncturation of the summit of the gibbosity on the elytra is, however, sparse and not rugulose. The prothorax is twice and a half again as wide as long, the puncturation of its disc is somewhat intermediate in character between that of the head and of the elytra; the puncturation of its sides is very coarse and rugged.

Compared with *P. reticulata*, Marsh., apart from colour and the gibbosity of the elytra, the present insect has the head and disc of prothorax very much more strongly and closely punctured, the latter having its front angles less conspicuously mucronate, its sides much less strongly rounded, and its hind angles quite well defined. The elytra are sculptured (leaving the whitish blotches out of account) very much as those of *P. reticulata*, but are at the sides a little more coarsely, and behind a little more closely verrucose. The undersurface is scarcely different from that of *reticulata*. The apical ventral segment of the female is sparingly covered with fine, deep, and conspicuous punctures.

This species belongs to Dr. Chapuis' First Group of *Paropsis*.

Australia; I am uncertain of the exact habitat.

P. insularis, sp. nov. Subrotundata; convexa; fulvo-testacea, antennis extrorsum et abdomine subinfuscatis; prothorace ad latera rotundato-dilatato, disco sparsi indistincte punctulato, lateribus impressis sat crebre varioloso-punctulatis, angulis anticis sub-mucronatis posticis plane rotundatis; elytris crebre profunde punctulatis, interspatiis fortiter elevatis verrucosis.

Maris tarsorum anticorum articulo 1° subtus ovali planato. Long., 5 l.; lat., 4 l.

The almost unicolorous fulvous or yellowish-brown colour, together with the non-bisinuate sides of the prothorax and the elytra quite as strongly and closely verrucose as those of *P. reticulata*, Marsh., will distinguish this species from all its intelligibly described congeners appertaining to Dr. Chapuis' First Group (of which it is a member), except *P. reticulata*, Marsh., from which (disregarding colour) it differs *(a)* in shape, being evidently less strongly convex, and with a much more rounded outline, *(b)* in sculpture, the close-set wart-like elevations on its elytra being (not *larger* in area, but) more prominent than in *P. reticulata*, and more spread over the whole surface, being well defined even around the scutellum. The punctures on the disc of the prothorax are individually much less distinct than in *P. reticulata*, and are not collected into clusters as they are in that species. The prosternum resembles that of *P. reticulata*.

Kangaroo Island; taken by Mr. J. G. O. Tepper.

P. nitidissima, sp. nov Breviter ovata; convexa; rufo-ferruginea; mandibulis apice, labro medio, antennis (articulis basalibus 4 exceptis), linea longitudinali media maculaque utrinque rotundata et in vertice et in prothorace, signaturis nonnullis longitudinalibus in elytris, mesosterni metasterniique macula laterali, et genubus, nigris; capite prothoraceque minus nitidis subcoriaceis et crebrius sat subtiliter punctulatis, hoc quam longiori plus duplo latiori ad latera vix impresso; scutello elytrisque nitidissimis; illo lævigato; elytris crebre subtiliter (quam prothorax magis subtiliter) punctulatis, lineis longitudinalibus lævigatis vix manifeste notatis. Long., 5 l.; lat., $3\frac{2}{5}$ l.

In the example before me the black marks on the elytra appear to be fragments of three parallel longitudinal discal lines, of the inner two of which there is only a short piece slightly behind the base while the external one consists of a post-basal fragment, an elongate median piece, and a sub-apical spot; the short central longitudinal black line with a black spot on either side of it on both head and prothorax is a very distinctive character if constant. The prothorax at its widest is nearly half again as wide as across the tips of the front angles (which are well produced but not very acute), and is to the greatest width of the elytra about as 12 to 17; the sides have a distinct upturned (or thickened) margin, inside which is a well defined but narrow (scarcely wider than the margin itself) gutter; the thickened margin is not continued along the base, and only for a very short distance along the front; the sides diverge not very strongly and almost in straight lines from the front angles almost to the base and then are strongly rounded and converge to the base into which they merge without a distinct angle. The puncturation of

both prothorax and elytra is perfectly even (*e.g.*, does not alter its character at all towards the margins), except that on the elytra there is a scarcely traceable indication of some longitudinal lævigate lines (they are so faint and irregular on the example before me as to be perhaps only accidental). Looked at obliquely from the side, the humeral angles of the elytra appear very well defined and the external outline of the elytra is quite strongly concave from the humeral angles nearly to the middle of the margin. The under surface is nitid and without distinct sculpture. The prosternum is widely and strongly compressed along its whole length, the surface of the broad elevation thus formed being flattened and protruding well behind the anterior coxæ, its hinder extremity being strongly and triangularly emarginate ; its width between the anterior coxæ is about equal to the width of the anterior tibiæ at their apex. This species belongs to Dr. Chapuis' Second Group of *Paropsis*.

N. S. Wales, Richmond River district ; sent to me by Mr. T. G. Sloane.

P. hemisphærica, Chap., var. ? *Meyricki*. Hemisphærica ; valde convexa ; nitida ; supra rufo-testacea, capite paullo obscuriori, mandibulis apice et antennis (articulis basalibus nonnullis exceptis) nigris ; subtus nigra, lateribus metasterni medio et abdominis apice ferrugineis ; pedibus ferrugineis ; capite crebre sat crasse punctulato haud longitudinaliter impresso ; prothorace quam longiori fere triplo latiori, crebre subtilius subaspere punctulato, ad latera paullo crassius punctulato leviter impresso ; scutello punctulato ; elytris sat fortiter sat crebre (quam prothorax minus crebre) punctulatis, interstitiis crebre minute punctulatis, lineis longitudinalibus sublævibus vix manifeste notatis. Long., $3\frac{2}{5}$—4 l. ; lat., $2\frac{2}{5}$—3 l.

The shape of the prothorax is characteristic ; looked down upon from the point whence its length seems greatest the head has almost the appearance of being inserted into a cavity formed by three straight lines constituting the front margin of the prothorax, and a line drawn across the greatest width of the prothorax (where it is about half again as wide as across the tips of the front angles) would fall scarcely behind its line of contact with the back of the head ; the sides and base of the prothorax form an almost continuously even curve ; the sides have a well-defined thickened margin, inside which the lateral gutter is a mere stria, and this thickened margin is quite defined all along the front margin and base. The puncturation of both prothorax and elytra is a little coarser and stronger near the lateral margins than elsewhere. Looked at obliquely from the side the humeral angle of the elytra appears much rounded off and the external outline of the elytra appears as somewhat evenly and gently con-

vex with a long slight sinuation behind the middle. The undersurface is nitid and strongly and sparingly punctured except on the metasternum, the greater part of which is hardly punctulate, but is transversely strigose. The prosternum is narrowly carinate, the carina being flattened above and sulcate down the middle; between the anterior coxæ it is scarcely so wide as the width of the second joint of the maxillary palpi. The convexity of the body is so great that if it be looked at from the side the length of the elytra is only about one-seventh greater than the height of the insect (*i.e.*, the distance from the under to the upper surface). The antennæ are three-fifths as long as the whole body. Belongs to Dr. Chapuis' Second Group of *Paropsis*.

This species is perhaps a form of *P. hemisphærica*, Chap., stated to be from "Australia" without more precise mention of locality. As I have before me several specimens all differing from the description in the middle part of the metasternum being more or less testaceous and the antennæ (except at the base) being quite black, it does not seem out of place to give it a distinctive name as being at least a well-marked variety.

W. Australia; taken by E. Meyrick, Esq.

P. mimula, sp. nov. Hemisphærica; valde convexa; nitida; rufo-testacea, palporum articulo ultimo et antennis (articulis basalibus nonnullis exceptis) nigris; capite crebre sat fortiter punctulato haud longitudinaliter impresso; prothorace quam longiori duplo latiori, subtiliter sat sparsim punctulato, ad latera crasse punctulato nec impresso; scutello haud punctulato; elytris sat fortiter sat crebre (quam prothoracis disco multo fortius) punctulatis, interstitiis minute nec confertim punctulatis, lineis longitudinalibus sublævibus vix manifeste notatis. Long., $3\frac{2}{5}$ l.; lat., 3 l.

Apart from the differences of puncturation, &c., mentioned above, this species is very like *P. Meyricki*, but is even more spherical than that species. The shape of the prothorax is almost identical in the two, but in the present species that segment is (by measurement) decidedly less strongly transverse than in the other. The undersurface has no distinct puncturation. The external outline of the elytra and the structure of the prosternum are as in *P. Meyricki*. The antennæ are distinctly shorter than in that species. This insect, as also the preceding one, differs from its near allies in the combination of antennæ quite black (except near their base) with the almost complete absence on the elytra of longitudinal lævigate spaces.

South Australia, Yorke's Peninsula.

P. confusa, sp. nov. Ovata; sat convexa; nitida; testacea, elytris (his fusco-punctulatis), et nonnullis exemplis pro-

thorace abdomineque, plus minus fusco-umbratis; prothorace quam longiori vix duplo latiori, sat crebre duplo-punctulato, latera versus profunde impresso et crassius punctulato, angulis anticis productis acutis posticis rotundatis, lateribus pone medium sat rotundatis antice vix sinuatis; scutello subtiliter sparsim punctulato; elytris subfortiter sat crebre confuse punctulatis, lineis longitudinalibus sublævibus vix manifeste instructis, puncturis circa scutellum magis sparsim positis. Long., $3\frac{1}{5}$—$3\frac{3}{5}$ l.; lat., $2\frac{2}{5}$—$2\frac{3}{5}$ l.

The sexes do not seem distinguishable externally except by the usual characters of the tarsi. The prothorax is at its widest a little in front of the base, which is about half again as wide as the front. The puncturation of the head scarcely differs from that of the prothorax; it consists of larger and smaller punctures rather evenly mingled, the larger punctures, however, being much smaller than those on the disc of the elytra. The lateral impression of the prothorax is particularly well marked, but the puncturation of the lateral surface is not so coarse as in many others of the genus. There is no marginal space of the elytra definitely marked off by its special puncturation, but the puncturation of the general surface becomes evidently stronger as it approaches the margin. The shoulders are much rounded, and the elytral outline is scarcely sinuate behind them. The prosternum is moderate, sulcate down the middle, gradually wider hindward; at its hind apex (which is rounded) about as wide as the truncate apex of the maxillary palpi. The undersurface is almost lævigate, except the hind body, which bears some fine sparse puncturation. The antennæ reach back to about the apex of the metasternum. In some examples they are a little infuscate towards the apex.

This species belongs to Dr. Chapuis' Second Group of *Paropsis*, on account of its elytral puncturation being non-rugulose, and not running in rows. It does not seem very close to any previously-described species.

Kangaroo Island; taken by Mr. J. G. O. Tepper.

P. circumdata, Newm. The brief description of this species is almost word for word identical with the description of *P. rufipes*, Fab. In the absence of any direct evidence to the contrary, Newman's name should be dropped as a mere synonym.

P. aenea, sp. nov. Ovalis; convexa; nitida; rufo-testacea, capite prothoraceque plus minus æneseentibus, elytris æneo-vel viridinigris, antennis corporis dimidio brevioribus; capite sat fortiter punctulato; prothorace quam longiori multo plus duplo latiori, crebrius subtilissime (latera versus puncturis nonnullis sat magnis additis) punctulato, a basi ad apicem arcuatim angustato, angulis anticis parum productis parum

acutis, posticis bene distinctis, lateribus leviter sat æqualiter rotundatis; scutello haud punctulato; elytris vix striatis, striis subtiliter punctulatis, interstitiis punctulatis, puncturis in interstitiis quam in striis vix subtilioribus. Long., $2\frac{1}{2}$—3 l.; lat., $1\frac{3}{5}$—$1\frac{4}{5}$ l.

This species has a certain superficial resemblance to a *Gyrinid*. I have seen a good many specimens, and they do not show any tendency to variation except in the extent of the æneous colouring on the head and prothorax. The elytra are of a deep black-green colour, without any other tint whatever except at the base of the epipleuræ, of which the inner portion of the dilated piece (adjacent to the metasternum) is invariably bright-testaceous. The head (especially towards the sides and on the clypeus) is more strongly punctured than the disc of the prothorax or the elytra. The prothorax is punctured about as strongly (on the disc) as the interstices of the elytra, which are not much more finely punctured than the fine scratch-like striæ; the punctures in the interstices differ a little in character from those of other parts of the surface, being like fine somewhat longitudinal scratches. The prosternum is carinate along its whole length, the carina prominent and acute in front, gradually dilated hindward, at its truncate hind-extremity slightly wider than the length of the basal joint of the antennæ, bisulcate, the space between the sulcæ (or striæ) convex. The under surface is very nitid, scarcely distinctly punctulate.

Dr. Chapuis has very briefly described two species (*P. æneipennis* and *subænescens*) from Queensland and New South Wales which seem to be near the present insect. They, however, both appear to be smaller than the smallest specimen I have seen of *P. ænea*; the former is said to be "*ovata*" and the latter "*breviter ovata*," and in neither case does the description of colour quite agree with the present insect, which at any rate (even if the discrepancies in size and shape can be got over) is a well-marked local form in point of colour.

South Australia.

P. polyglypta, Germ. Dr. Chapuis is, I think, in error, in regarding this as identical with *P. intacta*, Newm. The description of the latter species is an exceptionally poor one, relating literally only to size, colour, and markings. *P. polyglypta*, on the other hand, is well and sufficiently described. Newman states that his insect came from Port Philip, and Germar that his was taken near Adelaide. Now a species agreeing well with Germar's description is very plentiful around Adelaide, and is undoubtedly *P. polyglypta*, and I have before me from Melbourne a species perfectly distinct from *polyglypta*, and agreeing with Newman's description of *intacta* quite as well as Germar's *polyglypta* does. The colour and markings of these two do not

differ in any way that I can specify ; *polyglypta* being very variable in markings it is probable that the other is also variable. The male of the Victorian insect, which I regard as *P. intacta* (I have not seen a female) is distinctly shorter (in proportion to its length) than the male of *P. polyglypta*, with more rounded sides. In *polyglypta* the prothorax is quite distinctly more transverse, being (by measurement) very nearly twice and a half as wide as long ; its base is not quite half again as wide as its front margin, its sides are very evidently rounded, and its greatest width is well in front of the base. In *intacta* the same segment is scarcely twice and a-third as wide as long, its base is slightly more than half again as wide as its front margin, its sides are only very slightly rounded, and its greatest width is almost at the actual base.

P. Froggatti, sp. nov. ♀ Ovata ; sat nitida ; supra testaceo-livida ; capitis macula media magna, prothoracis macula media magna et utrinque maculis 2 minoribus longitudinaliter positis, scutello pro parte, et elytrorum singulorum macula humerali sutura striisque 10, nigricantibus ; subtus atra, nitida, pro- et meso-sternis ad latera rufescentibus ; pedibus palpis et antennis testaceis (harum parte dimidia apicali nigricanti) ; capite prothoraceque crebre duplo-punctulatis, hoc latera versus late impresso vix crassius punctulato ; scutello lævi ; elytris profunde striatis, striis irregulariter fortiter biseriatim punctulatis, interstitiis fortiter convexis nullo modo (nisi juxta basin) punctulatis. Long., 7 l. ; lat. 5 l.

Very much like *P. polyglypta* and *intacta* in respect of the colouring and pattern of the upper surface, but at once distinguishable from both those species by the perfectly black underside (paler only on the sides of the head, prosternum and mesosternum), and by the entirely different sculpture of the elytra, on which the striæ are deeper, and especially wider, each bearing very evidently *two* rows of coarse punctures, somewhat mixed together, and the interstices are quite strongly convex, and in their hinder two-thirds entirely devoid of puncturation. The female differs from that of *P. polyglypta* in its elytra being decidedly more (and more abruptly) widened behind the middle.

New South Wales, taken in the Australian Alps ; and sent to me by Mr. Froggatt, of Sydney, to whom I have much pleasure in dedicating the species.

PAROPSIS NIGERRIMA, *Germ.*

This species is, I think, only a variety of *P. alternata*, Germ., with the testaceous markings absent. I can find no other distinction.

PHYLLOTRETA.

P. australis, sp. nov. Subovata; nigra; antennis (harum articulo 5° paullo elongato) tibiisque basi rufis vel testaceis, elytris vitta discoidali (basi introrsum flexa, apice intus leviter arcuata et extus leviter dilatata) flavo instructis; supra confertim punctulata. Long., 1 l.; lat., $\frac{1}{2}$ l.

Extremely like the European *P. undulata*, Kuts., the yellow stripe on the elytra being quite as in that species; but the puncturation throughout is very much closer and finer. From *P. bivittata*, Waterh. (the previously described Australian species of the genus), this species differs in the colouring (Mr. Waterhouse says that the antennæ and legs of his insect are invariably totally black), and also apparently in the puncturation; Mr. Waterhouse compares *P. bivittata* to *P. nemorum*, Linn., and says that the *prothorax* is more closely punctured, thus implying that the puncturation of the elytra is similar to that of *P. nemorum*, but in the present insect the elytra are very much more closely and finely punctured.

South Australia; also Victoria; on *Cruciferæ*.

BUPRESTIDÆ.

MELOBASIS.

M. costata, Thoms. (Typ. Bupr. App. I., p. 16). This name is preoccupied by Sir W. Macleay. Judging from the descriptions, it is possible that both names refer to the same insect, which (pending the decision of this point) should stand thus—*M. costata*, Macl. (Trans. Ent. Soc., N.S.W., II., p. 24); ? *costata*, Thoms. (loc. cit.).

M. costifera, Thoms. (loc. cit., p. 16). There can hardly be a doubt that this is identical with *M. costata*, Saund., since renamed "*Saundersi*," Masters.

M. prasina, Thoms. (loc. cit., p. 17). The description of this insect hardly distinguishes it from some vars. of *M. verna*, Hope, though it is very likely to be distinct.

M. purpureosignata, Thoms. (loc. cit., p. 18). For this name —previously used for a *Melobasis* by Laporte and Gory—I propose *Thomsoni* as a substitute.

M. viridiobscura, Thoms. This species must be very close to *M. obscura*, Saund., which I renamed (*obscura* being a preoccupied name) *sordida* (Tr. Roy. Soc., S.A., 1887, p. 238). There are some discrepancies (*e.g.*, M. Thomson does not refer to the transverse wrinkling of the prothorax, and his "*elytra obsolete striata*" hardly fits *M. sordida*), which render it probable that the types, if placed side by side, would be found to differ, but it is perhaps

well to draw attention to the possibility of identity, as M. Thomson's name would have priority if the insects are not distinct.

ANILARA.

M. Thomson, in his Typ. Bupr. App. I., describes two new species of this genus—*platessa* and *Deyrollei*—from Adelaide neither of which is known to me. Judging from the description of the latter, I should say that *A. planifrons*, Blackb., is very near it, but M. Thomson's statement of his insect "corpus subtus * * * * sat grosse rugoso-punctatum" is quite conclusive as to their being specifically distinct. The description of *A. platessa* is much too short, but it reads very like a description of the insect which I take to be *A. Adelaidæ*, Hope; unfortunately, however, M. Thomson does not mention whether the vertex bears an impressed line, and in the absence of information on that point it is impossible to decide the matter. Mr. E. Saunders (Tr. E.S., 1868, p. 19) published an enlarged but still brief description of the type of *A. Adelaidæ*, accompanied by a figure which makes it appear a wider species than the measurements annexed to the description would show it to be. The types which I refer to it agree with the figure.

STIGMODERA.

I have received by the courtesy of M. Kerremans a copy of a valuable memoir recently published by him containing notes on certain species of this genus, together with some ably-written descriptions of new species. The following remarks on the memoir will perhaps be of interest:—

S. picea, Kerrs. This species is very probably identical with *S. pubicollis*, Waterh. (var. *major*). If so, M. Kerremans seems right in considering it a good species.

S. fusca, Saund. The author points out very rightly that Mr. Saunders' substitution of this name for *Parryi*, Hope (a substitution adopted in Masters' Catalogue) is quite unjustifiable.

S. Castelnaudi, Thoms. (nec Saund.). The author proposes for this name (which is preoccupied) the substitution of "*Laportei*." But *Laportei* is itself preoccupied, having been used for a *Stigmodera* by M. Boheman, and also Mr. Masters had already substituted "*Thomsoniana*" for *Castelnaudi*, Thoms. (Proc. L. S., N.S.W., XII.).

S. apicalis (White, ms.) Kerrs. The author furnishes a description of this previously undescribed insect, but he seems to have overlooked the fact that the name has been previously used by Rev. F. W. Hope and accepted and published by Laporte and Gory for a different insect. I propose, therefore, for the present species the name *Kerremansi*.

S. distinguenda, Thoms. For this, the name being preoccupied, the author proposes to substitute "*fraterna*."

S. flava, Thoms. This name being preoccupied, the author proposes "*flavidula*," overlooking the fact that Mr. Masters (loc. cit.) has already proposed *flavescens*.

S. cælestis, Kerrs. The name *cælestis* being pre-occupied by M. Thomson (Arch. Ent. I., p. 113), I propose "*stillata*" as a substitute.

S. obesissima, Thoms. (Typ. Bupr. App. I., p. 32). The habitat given for this species is simply "Australia." I have seen an example belonging to Mr. C. French, which was taken in Queensland.

S. marmorea, sp. nov. ♂ Minus lata; minus convexa; sat nitida; nigro-ænea, elytris obscure rufis testaceo-maculatis; capite sternisque dense, abdomine sparsius, griseo-pilosis; capite vix concavo, linea longitudinali leviter impresso, confertim subtilius punctulato; prothorace quam longiori (et postice quam antice) duabus partibus latiori, confertim subtilius punctulato et minus crasse (ad latera magis fortiter) vermiculato-ruguloso, antice fortiter bisinuato vix concavo, lateribus leviter arcuatis, basi leviter bisinuata; elytris fortiter striatis, striis subtiliter punctulatis, interstitiis subcarinatis subtiliter sparsim punctulatis, interstitio 6° ad basin late crasse ruguloso postice punctis nonnullis magnis instructo, margine basali leviter æqualiter convexo, apice leviter truncato; corpore subtus crebre subtilius sat æqualiter sat aspere (abdomine minus crebre minus aspere) punctulato; segmento ventrali apicali quam penultimum parum longiori, paullo magis crebre punctulato, apice arcuatim emarginato. Long., 14½ l.; lat., 5 l.

The testaceous spots on the elytra are not very conspicuous or well defined, and probably are variable. In the example before me there are on each elytron an elongate spot running backward from the middle of the base, a small spot near the suture a little in front of the middle, two or three small spots placed transversely a little behind the middle, and a larger oval spot placed transversely near the apex, and the lateral margin is narrowly testaceous except close to the base and apex, its testaceous colour being a little dilated inward at intervals along its course. From the position of the testaceous spots I should conjecture that in some examples the elytra might bear four more or less interrupted transverse fasciæ. An elevated carina (abbreviated at both ends) runs down the prothorax of the example before me but is perhaps the result of the vermiculate interstices being accidentally continuous at that part.

This insect must be placed among the large vermiculate-rugulose species of *Stigmodera*, but I do not know any species to which I can say that it is nearly allied; perhaps it suggests the idea of *Reichei*, L. & G., as much as anything.

In order to compare it with a well-known and common species I place it beside an example of *S. Mitchelli*, Hope, and find that (disregarding colour and markings)—the head differs chiefly in being pilose and very much more closely and finely punctured—the prothorax chiefly in being vermiculately rugulose with the intervals of the rugæ very closely punctulate, and also in having its sides very much less strongly rounded and its front margin more strongly bisinuate—the elytral sculpture is not very different—and the sculpture of the underside differs chiefly in the ventral segments being more closely punctured and a little more disposed to rugulosity. The general form is much more elongate and less robust than that of *S. Mitchelli*. The extremely crowded sculpture of the prothorax seems to be a very distinctive character; it is very much more crowded than in *S. grandis*, Don.—more so also than in *S. Stevensi*, Gehin.

S. Australia; a single example in the S. Australian Museum.

S. Karattæ, sp. nov. ♀ (?) Minus lata; sat convexa; sat nitida; subtus sat alte griseo-pilosa; supra sanguinea, capite prothorace (lateribus exceptis) et elytrorum fasciis 3 margineque apicali nigro-cœruleis; corpore subtus pedibusque cyaneis, prosterni abdominisque lateribus et hujus apice sanguineis; capite inter oculos longitudinaliter concavo, subtilius sat crebre punctulato; prothorace ad latera vix manifeste marginato, quam longiori (et postice quam antice) vix duabus partibus latiori, crebre sat fortiter punctulato, antice vix bisinuatim leviter concavo, lateribus sat rotundatis, basi leviter bisinuata; elytris fortiter striatis, striis subtiliter punctulatis, interstitiis sub-carinatis subtiliter sparsim punctulatis, interstitio 6° ad basin late ruguloso, margine basali leviter convexo, apice rotundato; corpore subtus crebre subtilius sat aspere (abdomine paullo minus crebre vix aspere, sternis in medio sparsim) punctulato; segmento ventrali apicali quam penultimum sat longiori, subtiliter creberrime punctulato, postice transversim depresso et subtruncato; unguiculis simplicibus. Long., 9—10½ l.; lat., 4—4¼ l.

The markings on the prothorax and elytra scarcely differ from those of *S. Mitchelli*, Hope, and probably are equally variable. In the two examples before me those on the elytra differ so much (the front fascia in one being much broader than in the other, and the hindmost fascia in one being reduced to two spots) that it would be waste of space to describe them. The species is very near to *S. Mitchelli*, but very distinct, differing from the corres-

ponding sex of that insect as follows:—The head is much more hollowed out down the middle, and evidently more closely and finely punctured; the prothorax is at its widest nearer to the base, and its thickened lateral edging is almost obsolete; the elytra are not in the least sinuate at the apex, and the apical ventral segment is very much more closely and finely punctured, and its hinder portion is abruptly depressed—almost concave transversely—its apex, moreover, being almost sharply truncate instead of evenly rounded. (In the other sex of *Mitchelli* this segment is arcuately emarginate at the apex.) In the examples before me the sanguineous lateral border of the prothorax is wider than the pale margin in any specimen that I have seen of *Mitchelli*.

Kangaroo Island; taken by Mr. J. G. O. Tepper.

S. jubata, sp. nov. ♀ (?) Minus lata; minus convexa; nitida; omnino (elytris exceptis) pilis subtilibus erectis griseis sparsim vestita; versicolor (altero situ viridis vel æneoviridis, altero splendide cuprea vel purpurea); elytris singulis vitta discoidali angusta (postice dilatata) a basi usque ad medium producta, macula marginali pone humerum, et macula transversa arcuata ante apicem posita, flavis ornatis; capite prothoraceque subtilius sat crebre punctulatis; illo longitudinaliter late leviter concavo; hoc ad latera haud marginato, quam longiori (et postice quam antice) dimidia parte latiori, antice bisinuatim leviter concavo, lateribus leviter arcuatis, basi leviter bisinuata; elytris striatis, striis punctulatis, interstitiis minus convexis vix manifeste punctulatis, apice truncato et vix bispinoso, marginibus postice haud denticulatis; corpore subtus subtiliter (sternis in medio sparsim latera versus crebre, abdomine minus crebre) punctulato; segmento ventrali apicali quam penultimum paullo longiori, vix aliter punctulato, postice rotundato-truncato, ante apicem in medio leviter sub-foveato; unguiculis simplicibus. Long., 9 l.; lat., $3\frac{1}{5}$ l.

Tasmania; in the collection of C. French, Esq.

S. Frenchi sp. nov. ♀ (?) Sat elongata; minus convexa; sat nitida; subtus et in capite griseo-pilosa; capite, pedibus, prothorace (hoc ad latera maculatim flavo), sternis (his ad latera et hic illic maculatim flavis), segmentorum ventralium marginibus anticis posticisque et maculis nonnullis lateralibus, pedibusque, nigris vel cœruleo-nigris; elytris pallide flavis, postice latera versus læte sanguineis, basi anguste ænea, sutura ab apice fere ad scutellum sat late cyanea; hoc colore circum apicem, pone medium (rotundatim), ad medium (fasciatim), et ante medium oblique antrorsum, utrinque

dilatato ; capite prothoraceque sat crebre subfortiter punctulatis ; illo longitudinaliter sub-tri-sulcato, sulco medio lato parum profundo, sulcis lateralibus vix perspicuis ; hoc ad latera haud marginato, quam longiori (et postice quam antice) fere duabus partibus latiori, antice bisinuatim vix concavo, lateribus a basi fere ad medium subrectis antice arcuatim convergentibus, basi in medio latissime lobata ; elytris striatis, striis subtiliter punctulatis, interstitiis leviter convexis minus subtiliter punctulatis, apice rotundato, marginibus postice haud denticulatis ; corpore subtus minus fortiter minus crebre (sternis ad latera sat fortiter sat crebre) punctulato ; segmento ventrali apicali quam penultimum fere duplo longiori, haud aliter punctulato, postice rotundatim (fere angulatim) producto ; unguiculis ad basin haud dentatis. Long., 11 l. ; lat., 4 l.

A very distinct species. The elytra are of a very pale straw-colour, the lateral margin from about the middle to a little before the apex being bright-scarlet, this scarlet patch increasing in width from its front hindward. Looking at the two elytra together, one sees the cyaneous markings as one large continuous figure of very complicated pattern nowhere touching the margins except at the apex. By a little exercise of the imagination this figure may be regarded as bearing some resemblance to a human form seated, the rounded portion (deeply emarginate in front) near the scutellum being taken as the head, the fascia-like extension on either side (about the middle) representing the arms extended, the rounded dilatation (behind the middle) representing the outline of the bent legs, and the edging that runs round the apex forming the feet.

Judging from the description of *S. rubricauda*, Waterh., I should judge that this species resembles it, but that insect appears to be smaller, with the prothorax unicolorous and the elytra "bluntly pointed" at the apex (in *S. Frenchi* they are quite evenly rounded). The dark markings on the elytra of *rubricauda* appear moreover to be confined to the base, the hind part of the suture, and the extreme apex.

It should be noted that the wide shallow lobe forming the middle portion of the hindmargin of the prothorax falls into a corresponding emargination in the front of the elytra, as in *S. sanguinea*, Saund., *viridicincta*, Waterh., and allied species, near which, I think, the present insect should stand.

Victoria : presented to me by C. French, Esq.

S. Wimmera, sp. nov. ♀ (?) Lata ; sat depressa ; sat nitida ; obscure æenea ; prothorace (marginibus anguste æneis exceptis) et abdominis lateribus apiceque rufis ; elytris rufo-testaceis, margine antico et apicali (anguste) suturaque (angustissime,

nihilominus paullo pone scutellum minus anguste) æneis; capite sat fortiter sat crebre punctulato, longitudinaliter concavo et linea subtili impresso, prothorace ad latera marginato, quam longiori (et postice quam antice) fere duplo latiori, antice fortiter bisinuato vix concavo, rugulose fortiter sat crebre (postice in medio minus crebre) punctulato, linea mediana (antice obsoleta) lævi notata, lateribus fortiter rotundatis, basi undulatim bisinuata; elytris striatis, striis subtiliter punctulatis, interstitiis sat convexis sparsim minus subtiliter punctulatis, apice rotundato, marginibus postice haud denticulatis; corpore subtus (a capite ad apicem gradatim minus crebre magis crasse nihilominus sternis in medio sparsissime) rugulose punctulato; segmento ventrali apicali quam penultimum paullo longiori, postice late rotundato, apicem juxta leviter depresso sat crebre subtilius punctulato; unguiculis basi fortiter dentatis. Long., 13 l.; lat., $5\frac{1}{2}$ l.

Near *S. sanguiniventris*, Saund., from which (apart from want of pilosity, which may be sexual, and colour) the present species differs *inter alia* by the apices of its elytra being each quite evenly rounded. The difference of colour is chiefly seen on the prothorax, which in this insect is entirely red on the upper surface (except a narrow brassy edging) and entirely blackish-green beneath, while the same segment in *sanguiniventris* is of a dark bronzy colour, with its lateral margins both above and below red.

The base of the prothorax and front margin of the elytra are fitted to each other in the same manner as in *S. sanguinea*, Saund., *sanguiniventris*, Saund., &c., but this sculpture is less strongly defined than in those species.

Victoria, Wimmera district; in the collection of C. French, Esq.

S. Victoriensis, sp. nov. ♀ (?) Sat angusta; sat convexa; sat nitida; ænea (certo adspectu cuprea vel purpurascens); prothoracis lateribus et in elytris singulis signaturis quinis (sc. macula prope scutellum subrotundata, macula marginali elongata pone basin, fascia vix antemediana suturam haud attingenti, fascia pone medium suturam haud attingenti et macula parva subapicali), flavis; capite (hoc profunde longitudinaliter concavo) prothoraceque sat crebre sat fortiter punctulatis; prothorace ad latera haud marginato, quam longiori (et postice quam antice) dimidia parte latiori, antice leviter concavo leviter bisinuato, linea mediana irregulari lævi instructo, latitudine majori sat longe pone medium posita, lateribus sat fortiter rotundatis, basi fortiter bisinuata; elytris punctulato-striatis, interstitiis punctulatis

antice subplanatis postice convexis, apice oblique emarginato bispinoso (spina externa multo majori), lateribus postice subtiliter crenulatis ; corpore subtus crebre subtilius (sternis in medio multo minus crebre) punctulato ; segmento ventrali apicali quam penultimum vix longiori, postice truncato vix magis crebre punctulato, apicem juxta declivi ; unguiculis simplicibus. Long. 7 l. ; lat., $2\frac{3}{5}$ l.

The puncturation of the prothorax becomes gradually coarser and more sparse from the front to the base, but is not noticeably coarser at the sides. The upper surface is in colour and markings extremely like that of *S. cupreoflava*, Saund. (figured in Ins. Saund. III. 1, t. 1, fig. 14), but differs in the prothorax having its lateral margins yellow, in the basal spot on each elytron being smaller, the lateral spot not reaching the shoulder, the hindmost transverse spot not being continued hindward along the margin, and the presence of a small spot close to the suture near the apex ; the present species differs from *S. cupreoflava* also in its much less strongly punctured prothorax, devoid of an impressed dorsal line, &c. It also in markings and colour on the upper surface closely resembles a form of *S. octo-spilota*, L. & G., from which it differs by its dark undersurface, differently formed apex of elytra, less closely punctured prothorax, &c. The combination of elytra spinose at apex, prothorax with a yellow border, underside uniformly dark, elytra marked with yellow spots, will distinguish this insect from all previously described bearing any superficial resemblance to it.

Victoria ; the type (in my own collection) was taken near Ballarat.

S. eremita, sp. nov. Sat angusta ; sat convexa ; sat nitida ; ænea (certo adspectu obscure cuprea vel cyanea) ; prothoracis lateribus et in elytris singulis signaturis quaternis (sc. macula prope scutellum subrotundata, macula marginali elongata pone basin, fascia vix antemediana suturam fere attingenti, et fascia pone medium suturam haud attingenti) flavis ; capite (hoc late leviter longitudinaliter concavo) antice sat fortiter minus crebre, postice sat crebre subtilius, punctulato ; prothorace ad latera haud marginato, quam longiori (et postice quam antice) circiter dimidia parte latiori, antice leviter vix bisinuatim concavo, linea mediana irregulari lævi instructo, latitudine majori sat longe pone medium posita, lateribus sat fortiter rotundatis, basi minus fortiter bisinuata ; elytris punctulato-striatis, interstitiis vix distincte punctulatis antice subplanatis postice convexis, apice oblique vix emarginato, partis subemarginatæ angulo externo spiniformi, lateribus postice crenulatis ; corpore subtus sat longe minus

dense piloso; sternis fortiter rugulose sat crebre (parte mediana sparsim haud rugulose excepta) punctulatis; prosterno inter coxas sat angusto retrorsum gradatim angustato; segmentis ventralibus 1° 5° que præsertim in medio sat fortiter (fere ut sterna in medio), ceteris antice multo magis crebre subtiliter postice nullomodo, punctulatis; segmento ventrali apicali quam penultimum paullo longiori, postice truncato-vix-emarginato, juxta apicem quam antice haud magis declivi; unguiculis simplicibus. Long., $5\frac{1}{3}$ l.; lat., 2 l.

The possession in combination of the four characters mentioned above as distinguishing *S. Victoriensis* from most of its congeners will also distinguish this present insect from all previously described at all closely resembling it, except *S. Victoriensis*, which is very near it, but from which it differs in being smaller and in the absence of the yellow spot close to the apex of the elytra (it is no doubt uncertain whether either of these characters is constant), as well as in the following structural characters:—On the undersurface the middle piece of the prosternum is narrower even at its front (*i.e.*, at the point immediately before the front of the coxæ where its lateral striæ commence), and thence is very considerably narrowed hindward, so that the lateral striæ conspicuously approximate hindward. This form of prosternum is unusual in this genus, the sides of the middle piece being usually parallel or nearly so; indeed I do not know any very common and widely distributed species in which it is similarly formed; in *S. vittata*, Saund., however, it is very similar but not quite so decidedly narrowed hindward. The intermediate ventral segments in *S. eremita* are much more finely and closely punctured than in *S. Victoriensis*, except at their apical margin where there is a wide impunctate edging. In the example before me the sutural apex of the elytra is not distinctly prominent, whereas it is spiniform in *Victoriensis*; and the general shape offers a further distinction, *S. eremita* being less elongate and cylindric than its ally, and having elytra considerably wider at their post-humeral dilatation than the prothorax, their width at this point being about the same as at the dilatation behind the middle, whereas in *Victoriensis* the elytra at their post-humeral dilatation are considerably narrower than at their hinder dilatation and scarcely wider than the prothorax.

Western Australia, near Eucla; sent to me by Mr. Graham.

S. pallidipennis, sp. nov. Minus angustata; subdepressa; viridis vel nigro-ænea vel igneo-cuprea, elytris abdomineque totis pallide flavis, hoc basi submetallico-micanti; capite sat elongato crebre fortiter punctulato, longitudinaliter late profunde concavo; prothorace quam longiori (et postice quam antice) tribus partibus latiori, creberrime sat fortiter sub-

aspere (ad latera vix magis crasse) punctulato, antice vix bisinuatim leviter concavo, latitudine majori fere ad basin posita, lateribus vix distincte marginatis subrectis, basi fortiter bisinuata, angulis omnibus acutis ; elytris sat fortiter punctulato-striatis, interstitiis punctulatis antice leviter (postice gradatim magis fortiter) convexis, lateribus apicem versus minute denticulatis, apice emarginato leviter bispinoso ; corpore subtus confertim sat fortiter (sternis in medio minus crebre exceptis) sat aspere punctulato ; segmento ventrali apicali quam penultimum paullo longiori, haud aliter punctulato, alterius sexus (?) apice rotundato alterius (?) late vix bisinuato ; unguiculis simplicibus. Long., $4\frac{1}{2}$—$5\frac{1}{2}$ l. ; lat., $1\frac{3}{5}$—$1\frac{9}{10}$ l.

A flattish rather wide species much narrowed at both ends, not unlike *S. mustela-major*, Thoms., in outline save that the sides of the prothorax are much less rounded ; the shape of this segment—narrow in front with sides diverging from the front almost to the base itself in almost straight lines—is unusual in the genus. This character in combination with the colouring—entirely of a blackish or metallic colour except the elytra and abdomen which are entirely pale testaceous—will, I think, distinguish the present species satisfactorily. I have seen several examples which vary *inter se* only in respect of the darkly coloured parts being coppery or green or blackish as the case may be.

S. Australia ; Port Lincoln district.

S. Dawsonensis, sp. nov. Sat lata ; minus convexa ; sat nitida ; subtus vix pubescens ; nigra, elytrorum maculis 4 (sc. macula parva discoidali prope basin posita, alia paullo majori post-humerali, alia magna subrotundata vix ante medium posita, alia angusta transversa ante apicem) flavis ; capite minus elongato, longitudinaliter late sat profunde concavo, sat crebre sat fortiter punctulato ; prothorace sat convexo, in medio late longitudinaliter vix concavo, ante scutellum fovea parva instructo, quam longiori (et postice quam antice) vix plus dimidio latiori, ut *S. guttaticollis* (nihilominus ubique magis subtiliter) punctulato, latitudine majori vix pone medium posita, lateribus haud marginatis fortiter rotundatis, margine antico leviter vix sinuatim concavo, angulis posticis rectis, basi fortiter bisinuata ; elytris ut *S. guttaticollis* terminatis, punctulato-striatis, interstitiis punctulatis antice subplanatis postice sat convexis, lateribus postice haud denticulatis ; corpore subtus crebre sat subtiliter (prosterno magis fortiter subrugulose), in medio vix minus crebre, punctulato ; segmento ventrali apicali quam penultimum sat

longiori, postice triangulariter producto; unguiculis simplicibus. Long., $3\frac{4}{5}$ l.; lat, $1\frac{2}{5}$ l.

The elytra at their posthumeral dilatation are of the same width as at their postmedian dilatation, and a little wider than the greatest width of the prothorax. In the example before me the discoidal yellow spot near the base extends from the third interstice to the fifth inclusive. The posthumeral spot is on the external three interstices; the large, somewhat-rounded spot, with its hinder end at the middle of the elytra, becomes wider from the lateral margin (from which it is separated by one interstice) towards the suture (where it reaches the sutural stria). The sub-apical spot is separated by a single interstice from both suture and lateral margin, and is very narrow and nearly straight. The base of the prothorax is exactly the same width as the base of the elytra.

In order to compare this species with a familiar one I place it beside *S. cruentata*, Kirby, and find that (disregarding colour and markings) it differs chiefly as follows:—It is a little shorter, wider, and less convex; the head is considerably wider between the eyes, the prothorax is more transverse, with more strongly-rounded sides and (though the puncturation scarcely differs otherwise) without a distinct lævigate central line; on the underside it differs chiefly in the prosternum much more closely punctured in the middle, and in the apical-ventral segment being obliquely truncate on either side behind, the two truncate faces meeting in an angle in the middle (this may be sexual).

This species, in the general style of markings, &c., belongs to the most numerous group of this extensive genus, being devoid of markings, except on the elytra, and having these spined at the apex. The nearest to it are probably *S. Kreffti*, Macl., *lilliputana*, Thoms., and *neologa*, Thoms., all of which are described too briefly to indicate differences other than in markings, but they all seem to be differently marked; *Kreffti* has the "subapical fascia" continued along the lateral margin of the elytron, and there becomes of a deep-red colour; *lilliputana* is described as having no markings in the posterior portion of the elytra; *neologa* seems to be a larger insect of blue-green colour, with bright-red markings on the elytra, and without a discoidal spot near the base of the same.

Queensland; Dawson River district; sent to me by Mr. French.

S. trispinosa, Kerremans. There is nothing in the description of this species indicating any distinction from *S. bicincta*, Boisd. It is true the original description of the latter is not sufficiently detailed for its identification, but M. Thomson (Typ. Bupr. App. I., p. 34) has added details (presumably from inspection of the

type) which show that *S. trispinosa* must at any rate be excessively close to it.

S. rubrocincta, Kerremans. This name having been previously employed by M. Gehin (Bull. Soc. Mosel., 1855, p. 13) for a different species of *Stigmodera*, I propose to substitute *cincta* for M. Kerremans' name.

S. guttaticollis, sp. nov. Minus lata; sat convexa; sat nitida; subtus breviter pubescens; supra rubra; capite, prothoracis macula magna transversa antemediana in medio triangulariter retrorsum producta, scutello, et elytrorum maculis (sc. macula magna humerali utrinque posita, alia communi postmediana, alia utrinque postmediana, alia communi quadrata apicali), cyaneis; corpore subtus (prosterni lateribus rubris exceptis) antennis pedibusque cyaneis; capite sat elongato, longitudinaliter profunde concavo, sat fortiter sat crebre punctulato; prothorace subgibboso, quam longiori (et postice quam antice) plus dimidio latiori, postice in medio sat fortiter minus crebre (antice gradatim magis subtiliter magis crebre, latera versus gradatim magis rugosule) punctulato, latitudine majori sat longe pone medium posita, lateribus haud marginatis sat fortiter rotundatis, margine antico leviter bisinuatim concavo, basi fortiter bisinuata, angulis posticis acutissimis retrorsum directis, linea longitudinali lævi mediana fovea parva postice terminata; elytris apice obliique emarginatis (incisura intus vix manifeste, extus fortiter, spinosa), punctulato-striatis, interstitiis sat crebre punctulatis antice suturam versus modice (postice et latus versus fortiter) convexis, lateribus postice denticulatis; corpore subtus (sternis in medio exceptis) confertim minus fortiter subaspere punctulato; segmento ventrali apicali quam penultimum paullo longiori apice subsinuatim truncato; tibiis anterioribus 4 basi sat fortiter curvatis; unguiculis simplicibus. Long., $4\frac{1}{2}$ l.; lat., $1\frac{4}{5}$ l.

The elytra at their posthumeral dilatation are of the same width as at their post-median dilatation, and very slightly wider than the greatest width of the prothorax. The post-median common spot and the two other post-median spots form a transverse series across the elytra. The base of the prothorax is exactly the same width as the base of the elytra.

This species is distinguished from all its congeners except a small group by the following in combination:—Underside (except sides of prosternum) of uniform dark colour, prothorax and elytra with markings, elytra spinose at apex; of the few species not greatly different in size presenting this combination it seems nearest to *S. gibbicollis*, Saund., and *fascigera*, Kerremans; from

both these it differs entirely in its markings, and also from the former *inter alia* by its prothorax very strongly bisinuate at the base; the description of the latter is hardly detailed enough to specify other differences than of colour and markings. The prothorax in respect of markings is almost exactly like that of *S. Pertyi*, L. & G., without the basal dark mark which is present on the latter. I do not know any other species having the elytra similarly marked.

North Queensland; sent to me by Mr. Duboulay.

S. Lais, Thoms. The author does not quote a more exact habitat than "Australia" for this species. I have specimens certainly I think referable to it from Western Australia.

S. guttata, sp. nov. Sat lata; minus convexa; sat nitida; aureo-viridis, elytris abdomineque (hoc viridi-micanti) testaceis; illis basi summa, maculis parvis postmedianis utrinque 2 latus versus positis, et spinis apicalibus, obscure viridibus; capite sat elongato, longitudinaliter profunde concavo, sat fortiter sat crebre punctulato; prothorace quam longiori dimidio (postice quam antice duplo) latiori, postice in medio fortiter minus crebre (antice gradatim magis subtiliter magis crebre, latera versus gradatim magis rugosule) punctulato, latitudine majori longe pone medium posita, lateribus antice fortiter sinuatis pone medium ampliato-rotundatis, margine antico fortiter concavo in medio anguste producto, basi late sat fortiter lobata, angulis anticis valde acutis posticis rectis, linea longitudinali lævi mediana antice obsoleta postice fovea parva terminata; elytris apice oblique emarginatis bispinosis, punctulato-striatis, striarum punctis fuscis sat magnis, interstitiis minus convexis antice suturam versus sublævibus aliunde obscure punctulatis, lateribus postice denticulatis; sternis ad latera crasse sat crebre inmedio sparsim subtiliter, abdomine confertim subfortiter (processu intercoxali crassius sparsius excepto), punctulatis; segmento ventrali (feminæ ?) apicali quam penultimum sat longiori, postice rotundato; unguiculis simplicibus. Long., 9 l.; lat., $3\frac{2}{5}$ l.

Var. (?) Minor (long., 7 l.); elytris pone scutellum macula communi viridi instructis, macula postmediana utrinque singula.

The type of this species is very like *S. bimaculata*, Saund. (from North-West Australia), as figured (Journ. Linn. Soc. IX., t. 10, fig. 48), if the dark-coloured apex of the elytra were absent from the figure and a second dark spot were added between the spot represented on the elytron and the margin. *S. bimaculata*, however, is described as having a very differently sculptured prothorax (*e.g.*, with an impressed dorsal line, and a fovea near each posterior angle).

The base of the prothorax of the present species is quite as wide as the base of the elytra; these latter are slightly wider at their postmedian than at their posthumeral dilatation, and their base projects forward conspicuously and angularly at a point between the fifth and sixth punctulate-striæ.

From *S. straminea*, Macl. (of which I possess a type), *S. guttata* differs *inter alia* in the same respects as from *S. bimaculata*. I may remark here that *S. bimaculata* must be very close to *S. straminea*, judging from the figure and description of the former, which scarcely show any difference from the latter except in the postmedian spot on each elytron being nearer the suture and the apex of the elytra being more strongly spined. *S. cinnamomea*, Macl., and *auricollis*, Thoms., are near the present species; the former is insufficiently described, but has the head "finely punctured" and the elytra devoid of isolated spots; the underside of the latter is entirely metallic green.

S. Australia; Lyndoch Valley, &c.

S. guttatæ sexus alter (?). Sat angusta; sat convexa; elytris (exempli typici) basi summa (vix manifeste), sutura (hac ante apicem rotundatim dilatata), linea obliqua posthumerali, et macula postmediana prope marginem, viridibus; prothorace quam longiori (et postice quam antice) vix plus dimidio latiori, latitudine majori vix pone medium posita, lateribus sat fortiter rotundatis; elytris basi quam prothoracis basis sat latioribus, segmento ventrali apicali quam penultimum haud longiori, apice subsinuato; ceteris ut *S. guttatæ*.

Var.? Elytrorum notis viridibus plus minus (nec omnino) deficientibus; nonnullis exemplis cupreis (elytris abdomineque exceptis). Long., $6\frac{1}{2}$ l.; lat., $2\frac{1}{2}$ l.

This insect occurs in the same localities as *S. guttata*, and bears so many striking resemblances to that species that in spite of serious discrepancies I cannot satisfy myself that the differences are more than sexual. Each form is extremely variable—indeed, I have not seen two examples of either quite identical. The extreme of the last described form has elytra entirely testaceous except the suture; another example has the metallic colour of the suture interrupted in several places and a single metallic spot on either side behind the middle.

LAMELLICORNES.

BOLBOCERAS.

B. Richardsæ, sp. nov. ♂ Piceum; capite prothoraceque fortiter rugulose punctulatis; elytris subtiliter 14-punctulato-striatis, striis prope marginem magis fortiter impressis; pygidio den-

sissime hirsuto; tibiis anticis externe obtuse 6-dentatis; clypeo antice cornu porrecto valido minus elongato armato; scutello sat fortiter sat crebre punctulato; prothorace in medio profunde longitudinaliter excavato, partis excavatæ marginibus cornubus 4 armatis (sc. cornu postico mediano brevi erecto, alio antico mediano brevi erecto, alio utrinque majori intus incurvato). Long., 8 l.; lat. $4\frac{2}{5}$ l.

The sides of the clypeus about half way between the eyes and the frontal horn are subtubercularly elevated, and the front external angles of the ocular canthi are also prominent. The excavation on the prothorax is of a shape that defies exact description. It reaches from the horn-like elevation of the front margin hindward about three-quarters the length of the whole segment in the form of an extremely deep canal, which is of somewhat regular form in the lower half of its depth, but above that level it begins to widen out very irregularly, so that in some places it seems to be (on the level of the general surface) nearly twice as wide as in other places; the hinder part is limited by a well-defined keel-like ridge—a production of which forms the horn at the middle of the hind margin of the excavation, and which, instead of turning forward to edge the sides of the excavation, runs on transversely to near the lateral margin of the prothorax. The hinder end of the excavation is deeply cavernous. The puncturation of the general surface is continued within the excavation, where, however, it is less rugulose. The length of the horn on the clypeus is about equal to that of the horn on either side of the prothoracic excavation, and is also about equal to the length of the scutellum from its base to its apex. The surface of the prothorax is uneven even outside the excavation, but there is no indication of the deep fovea near the anterior angles which exists in many species of the genus. The striation of the elytra is very feebly impressed, and some of the striæ are obsolete in some part of their length. This species is not very like any other previously described.

South Australia; taken by Mrs. Richards near Warrina.

The Estuarine Foraminifera of the Port Adelaide River.

By Walter Howchin, F.G.S.

[Read August 5, 1890.]

Many of the Foraminifera have a cosmopolitan distribution, and are equally unrestricted with regard to depth. Not a few, however, and particularly those of a high testaceous development, are restricted to particular areas. The chief factors that are operative in limiting the range of certain species are apparently temperature and varying bathymetrical conditions. The restrictive influence of climate on many species offers an absolute barrier to their extended migrations; and whilst the limitations as to depth are not so definite as those dependent on surface-temperature, yet the majority of species are influenced by these conditions. We have, therefore, to recognise a vertical as well as a geographical distribution, and, generally speaking, there are moderately distinct zones which carry respectively a foraminiferal fauna that is characteristic of the depths in which they are found.

Amongst the shallow-water species, there are some which have become so far modified in relation to habitat as to flourish under brackish water conditions, and in some instances, as, for example, *Trochammina inflata*, *Miliolina fusca* and *Polystomella striato-punctata*, even showing a preference for such positions. The number of shallow-water Foraminifera, which may succeed in establishing themselves in an estuary, will probably depend on the relative saltness of the water, and this, of course, will be regulated by the variable proportions of sea- and surface-waters that intermingle in different estuaries. The amount of fresh water that may find its way into the Port River is no doubt proportionately less than occurs with estuaries where the rain is more continuous and the drainage from the land more direct than is the case with the Port River. The latter is, indeed, more of an inlet from the sea than an outlet of drainage from the land. From this cause the condition of the harbour is probably more distinctly marine than is usual with estuaries, which may account for the comparatively large number of species obtained within the area and greater robustness of shell-structure than is usual with estuarine examples.

The localities dredged were—1. The main passage of the North Arm, in the situations of *(a)* mid-stream, *(b)* on ground covered

with seaweed and sponges, *(c)* on mud banks nearer shore. 2. Brackish pools, covered at spring-tides, lining the margin of the river to the north of Birkenhead. 3. Several small creeks tributary to the main stream on the south side of Port Adelaide, near the Pinery.

I must not omit to mention a possible source of error in the enumeration of species supposed to be now living in our estuary, arising from the presence of Post-Tertiary marine deposits, exposed in the banks, and probably forming the bottom of the stream in some places. Some samples brought up by the dredge were quite valueless for the purpose desired, in consequence of the evident mixture of derived material with the recent forms, and a considerable number of species have been discarded from the list from a suspicion that they were from the fossiliferous beds referred to, and are not represented by living forms in the river at the present time. This only applies to the dredgings in the North Arm ; those secured from the brackish pools and the small creeks to the south of Port Adelaide are free from this source of error. But after the most careful examination with a view to the elimination of doubtful occurrences, some on the list may be proved by further investigation to be foreign to the living fauna. It is not improbable that the North Arm has been an inlet for saltwater dating from Post-Tertiary times, and although much diminished in area, and becoming more land-locked with the shallowing of the South Australian littoral, many of the littoral species of Foraminifera may have held their ground in the saltwater lagoons of the flats from a period when the coast-line was much further inland.

Miliolina, *Williamson.*

M. Boueana, d'Orbigny. A small and neatly-formed shell, ornamented by fine longitudinal striæ. Widely distributed in shallow waters of temperate and tropical seas. Moderately common on mud bottoms, North Arm.

M. bicornis, Walker and Jacob. An ornamented shell similar to preceding, but of stouter build and less regular in outline. A few examples taken from seaweed bottom, North Arm. Probably derived.

M. Ferussacii, d'Orbigny. Ornamented, with a few conspicuous longitudinal ridges or costæ on each side of test. A widely-distributed form at moderate depths. Rare on seaweed and mud bottoms, North Arm. The robustness of these shells suggests the probability of their being derived.

M. circularis, Bornemann. A small shell with few, much-inflated segments, and possessing a narrow crescentiform aper-

ture. This form was only noted at three "Challenger" stations, viz., Prince Edward Isle, Kerguelen and Bass' Strait, all in the Southern Seas, and was dredged at moderate depths. Rather scarce on seaweed bottom, North Arm.

M. subrotunda, Montfort. A very variable form, more compressed than the former, with which it is linked by numerous intermediate varieties. It has a wide distribution in shallow waters. A common form on seaweed bottom; less common on mud banks, North Arm.

M. oblonga, Montagu. A cosmopolitan species, and found at all depths. It is the commonest form of the genus in the Port River, where it is generally distributed, but shows preference for muddy bottoms.

M. labiosa, d'Orbigny. A few specimens occur which are very irregular in growth, with crescentiform aperture and prominent lips, which may belong to this species. In washings from seaweed, North Arm, and rare in small creeks near Pinery.

M. seminulum, Linne. Typical specimens of this widely-distributed foraminifer are not common in the Port River, its place being taken by the feebler form, *M. oblonga*. The examples are small, occur sparingly in all the situations examined, but most distinctly on muddy ground.

M. secans, d'Orbigny. One or two examples taken from seaweed ground are doubtful occurrences as living forms.

M. undosa, Karrer. The angles of chambers are marked by sharp and wavy costæ. A shallow-water species. The finest examples of this form obtained on the "Challenger" cruise were from East Moncœur Island, Bass' Strait. In the Port River the examples are small and not very characteristic. Only observed from mud-banks, North Arm, where it occurs in considerable numbers.

M. fusca, Brady. An arenaceous variety of the genus isomorphic with *M. oblonga*, and is distinctively a brackish water species, living in estuaries and pools at the mouth of rivers. It is a common form in such situations on the British coast. Found sparingly in brackish pools covered at high water near Birkenhead, and in moderate numbers on sandy bottoms in the small creeks near the Pinery.

M. (Triloculina) trigonula, Lamarck. Rare, in North Arm.

SPIROLOCULINA, *d'Orbigny*.

S. planulata, Lamarck. Rare, from seaweed-dredgings. North Arm.

S. limbata, d'Orbigny. A few examples occur in North Arm-dredgings which show a feeble development of limbation in the outer chambers.

S. grata, Terquem. Ornamented with fine longitudinal striæ. A common form in warm and shallow seas. A doubtful occurrence.

Cornuspira, *Schultze.*

C. involvens, Reuss. Small and semi-translucent examples, not uncommon on muddy banks, North Arm.

Reophax, *Montfort.*

R. nodulosa, Brady. A long and tapering foraminifer of arenaceous build. Chambers numerous, and of pyriform shape. This is one of the most interesting finds in the present researches, for with one or two exceptions on the coasts of Britain (including the Frith of Clyde and the estuary of the Dee), it has an exclusive deep water record, going down to 2,950 fathoms, and has been dredged from the Arctic and Antarctic seas. The local examples are relatively small, not exceeding one-sixteenth of an inch. In the Port River examples, the chambers are very numerous, in some specimens not less than seventeen, and are more angular and constricted at the sutures than is shown in Mr. Brady's figures. The shape of the chambers is indeed exactly that shown by Mr. Brady's *Reophax guttifera*, whilst the remaining features of the test are those of the species under which I have classed the objects. It would appear therefore that the slight distinctions that separate the two may only depend on local variations and are interchangeable. From Mr. Brady's descriptions I infer that the test, as known to him, was rigid, whilst those obtained from the Port River are flexible, suggestive of a chitinous membrane lining the inner surface of the shell. Moderately common on seaweed ground, and rare on mud bottoms. North Arm.

R. scorpiurus, Montfort. Rare on sandy ground. Pinery Creeks.

R. findens, Parker. A few straight and somewhat coarsely arenaceous foraminifera, having apertures at both ends, have been referred to this species, as well as a rather fine example with bifurcation at each end. Mr. Brady mentions a similar example of double bifurcation. A very rare species, only known hitherto from Gulf St. Lawrence and the estuary of the Dee. Rather scarce on sandy bottoms, Pinery Creeks.

Haplophragmium, *Reuss.*

H. cassis, Parker. This is one of the most striking and unexpected of the discoveries made among the estuarine forms. The test is coarsely arenaceous, and in contour is isomorphic with the hyaline species, *Cristellaria crepidula*. It is a very rare species. Mr. Brady states ("Challenger Report") that it is peculiar to the shallow water areas of the Northern seas. Its known distribution only comprises three localities, viz., Gaspé Bay, at the mouth of the St. Lawrence, 16 faths.; Lievdy Harbour, Disco, Greenland, 5 to 20 faths.; and Deva Bay, Spitzbergen, 7 faths. The occurrence of so rare a form at a spot very remote from its known range of distribution is of peculiar interest. A few specimens were taken on seaweed bottom, but it is moderately common on mud-banks nearer shore.

H. agglutinans, d'Orb. Spiralline in earlier segments and rectilinear in the later growths. Coarsely arenaceous. Very widely distributed, but it is more commonly found in deep water than in shallows. Rather scarce in brackish pool near Birkenhead, and moderately common in small creeks near Pinery on sandy bottoms.

Trochammina, *Parker* and *Jones.*

T. inflata, Montagu. A species of limited range, and very characteristic of shallow and brackish water conditions. It is found inhabiting the estuaries of Britain, and the only "Challenger"- records are north-east shores of Bay of Biscay and south-east portion of coast of Spain. This is, therefore, the first record of this species for the Southern Hemisphere. On seaweed ground, North Arm; brackish pool, Birkenhead; and small creek, near Pinery.

T. squamata, Jones and Parker. The habit of this species is more distinctly marine than the preceding, and extends to moderate depths. It has a somewhat wider range of distribution than *T. inflata*, although by no means common. Three or four examples of small size were obtained from the mud-banks, North Arm.

Clavulina, *d'Orbigny.*

C. communis, d'Orbigny. A straight and slightly-tapering foraminifer, constructed of fine sand grains. It is not uncommon in the South Pacific, occurs on west coast of New Zealand, and ranges to the Antarctic ice-sheet. An interesting form in our estuarine fauna, as it usually frequents deeper water. Moderately common in brackish pool at Birkenhead. Rare in creeks, near Pinery.

VIRGULINA, *d'Orbigny.*

V. Schreibersiana, Czjzek. A widely-distributed form both as to localities and depths. Rather scarce in North Arm.

BOLIVINA, *d'Orbigny.*

B. punctata, d'Orbigny. Found in all parts of the world, and at all depths. Very common on muddy bottoms, North Arm.

B. textilarioides, Reuss. Shorter than the preceding, with inflated chambers arranged in textularian order. Distribution less general than the preceding, and mostly confined to warm seas at moderate depths. Common on muddy bottoms, North Arm.

B. decussata, Brady. A few examples occur which have apparently intermediate characters of the present species and *B. reticulata*, Hantkin. Many specimens show a regular reticulation—more regular than is the case with *B. reticulata.* Mr. Brady notes the presence of similar intermediate characters in examples dredged between Cape of Good Hope and Kerguelen.

B. tortuosa, Brady. One or two specimens exhibiting a twisted form of growth were obtained from the seaweed bottom, North Arm, and have with some reservation, been classed with this species.

LAGENA, *Walker* and *Boys.*

The *Lagenæ* are amongst the most widely-distributed of the foraminiferal types. As a rule they seem equally at home in hot and cold climates, and at all depths. A few of the species have a more restricted range, which will be noted in specific reference. With two exceptions the following species were found limited to the North Arm; but as they prefer muddy bottoms, and the dredgings in other areas were chiefly on sandy ground, their rarity in the material gathered higher up the stream may have arisen from this cause.

L. lævis, Montagu. Moderately common.

L. clavata, d'Orbigny. Rather scarce.

L. gracillima, Seguenza. The most common form of the genus in the Port River.

L. distoma-margaritifera, Parker and Jones. An ornamented, distomatous foraminifer, which is only known as an Australian species. Two or three examples noted.

L. globosa, Montagu. Rather scarce. Amongst the specimens of this form a duplex example with single orifice occurred.

L. striata, d'Orbigny. A form which is more restricted to shallow water than many of its congeners. Common in North

Arm and rare in Pinery Creeks. Several monstrous examples were obtained in which two and three chambers were united to form a rectilineal or nodosarian mode of growth.

L. semistriata, Williamson. The examples are truncate at base, and in this way are intermediate with *L. crenata*, Parker and Jones. Moderately common.

L. marginata, Walker and Boys. Rather rare, North Arm and Pinery Creeks.

L. lucida, Williamson. Rather scarce.

POLYMORPHINA, *d'Orbigny*.

P. lactea, Walker and Jacob. Rather scarce, North Arm.

P. lanceolata, Reuss. Rather scarce, North Arm.

P. angusta, Egger. Rare on seaweed ground, North Arm.

DISCORBINA, *Parker* and *Jones*.

The *Discorbinæ* have a wide geographical distribution, and are generally limited to shallow-water conditions.

D. vesicularis, Lamarck. Rare in North Arm and small creeks.

D. rosacea, d'Orbigny. Rare in small creeks near Pinery.

D. dimidiata, Jones and Parker. Rare in North Arm.

D. turbo, d'Orbigny. Rare in North Arm. Probably derived.

D. valvulata, d'Orbigny. A hemispherical test with strong limbation. Rare in North Arm.

TRUNCATULINA, *d'Orbigny*.

T. lobatula, Walker and Jacob. Rare in North Arm and Pinery Creeks.

T. refulgens, Montfort. Rare in North Arm.

ROTALIA. *Lamarck*.

R. Beccarii, Linné Rare, but occurs in all positions where dredgings were taken. Very characteristic of estuarine conditions.

POLYSTOMELLA, *Lamarck*.

P. striato-punctata, Fichtel and Moll. This is probably the most characteristic estuarine form that exists among the foraminifera. It is found in almost all estuarine lists of species, and often makes its way a long distance up stream. It is the commonest species in the Port River, and occurs on the muddy flats of the North Arm in great abundance. It was also found in all the other situations where foraminifera were noted higher up the

stream. The specimens show a considerable range not only in size but in the ornamentation dependent on the number of septal lines, sutural punctations, and the variable development of the retral processes. A few examples show very deeply sunken septal lines, giving a crenate feature to the peripheral outline.

P. macella, Fichtel and Moll. A much depressed variety of *P. crispa*, and is the shallow-water and starved condition of the latter species. It is limited to the littoral of the warmer seas. Not so common as the last described species, but is moderately plentiful in association with *P. striato-punctata* on muddy flats of North Arm.

The above list contains fifty-one species, belonging to fifteen genera, of which six species at least may be regarded as doubtful occurrences in the living condition. The fauna, as a whole, is characteristic of shallow water and a temperate climate. Thirty-five of the species identified (which is equal to two-thirds of the whole) are living in British waters, whilst the remaining sixteen species, with one or two exceptions, are known as Australian or sub-tropical species. The objects of greatest interest in the fauna under consideration are the foraminifera with arenaceous tests, of which there are nine species present. I can find no record of the occurrence of *M. fusca*, Brady, beyond the limits of the estuarine waters of Britain. The rare *Trochammina inflata*, also a British estuarine species, occurs in considerable numbers high up the stream, and exhibits precisely the same peculiarities of shell-structure as are found in its congeners in the Northern Hemisphere. The still rarer species, *Haplophragmium cassis*, the geographical distribution of which, as previously known, was limited to a few points on the borders of the Arctic Circle, is not uncommon in some positions in the river. *Reophax nodulosa* is also a characteristic cold water species, living at abyssal depths, where the temperature is low, and reaches its greateat developments in size in Arctic and Antarctic waters. *Reophax findens* is a very rare form, limited to two localities in previous researches, one of which is the Gulf of St. Lawrence, where it was first discovered in association with *H. cassis*. The finding of these very rare forms in company in the Southern Hemisphere, agreeing with a like association in the Northern Hemisphere, is a coincidence as remarkable as it was unexpected. The presence of several Arctic and sub-Arctic species in our local waters supplies matter for speculation as to the possible migration of these and other forms to lower latitudes during a period of greater cold, and, in this way, reaching the southern shores of Australia, where they still maintain a lingering existence.

Genera and Species.	North Arm.		Brackish Pool, Birkenhead.	Small Creeks near Pinery.
	Washings from Seaweed.	Muddy Banks.		
Miliolina Boueana, *d'Orb.*	M.C.	M.C.	—	—
" bicornis, *W. & J.*	R.	—	—	—
" Ferussacii, *d'Orb.*	R.	R.	—	—
" circularis, *Born.*	R.S.	—	—	—
" subrotunda, *Montf.*	C.	R.S.	—	—
" oblonga, *Montagu*	C.	M.C.	R.S.	M.C.
" labiosa, *d'Orb.*	R.	—	—	R.
" seminulum, *Linné*	R.	R.	—	R.
" secans, *d'Orb.*	R.	—	—	—
" undosa, *Kar.*	—	C.	—	—
" fusca, *Brady*	—	—	R.S.	M.C.
" (Triloculina) trigonula, *Lam.*	R.	R.	—	—
Spiroloculina planulata, *Lam.*	R.	—	—	—
" limbata, *d'Orb.*	R.	R.	—	—
" grata, *Terq.*	M.C.	R.	—	—
Cornuspira involvens, *Reuss*	R.S.	R.	—	—
Reophax nodulosa, *Brady*	M.C.	R.	—	—
" scorpiurus, *Montf.*	—	—	—	R.
" findens, *Parker*	—	—	—	R.S.
Haplophragmium cassis, *Parker*	R.	M.C.	—	—
" agglutinans, *d'Orb.* ...	—	—	R.S.	M.C.
Trochammina inflata, *Montagu*	R.	—	R.S.	R.S.
" squamata, *J. & P.* ...	—	R.S.	—	—
Clavulina communis, *d'Orb.*	—	—	M.C.	R.
Virgulina Schreibersiana, *Cz.*	R.	R.S.	—	—
Bolivina punctata, *d'Orb.*	C.	V.C.	—	—
" textilarioides, *Reuss*	M.C.	C.	—	—
" decussata, *Brady*	R.	R.S.	—	—
" tortuosa, *Brady*	R.	—	—	—
Lagena lævis, *Montagu*	M.C.	M.C.	—	—
" clavata, *d'Orb.*	R.S.	R.	—	—
" gracillima, *Seg.*	M.C.	R.S.	—	—
" distoma-margaritifera, *P. & J.* ..	V.R.	R.	—	—
" globosa, *Montagu*	R.S.	R.S.	—	—
" striata, *d'Orb.*	M.C.	R.S.	—	R.
" semistriata, *Will.*	M.C.	R.	—	—
" marginata, *W. & B.*	R.	R.	—	R.
" lucida, *Will.*	R.S.	R.S.	—	—
Polymorphina lactea, *W. & J.*	R.	R.	—	—
" lanceolata, *Reuss*	—	R.S.	—	—
" angusta, *Egger*	R.	—	—	—
Discorbina vesicularis, *Lamk.*	R.	R.	—	R.
" rosacea, *d'Orb.*	—	—	—	R.
" dimidiata, *J. & P.*	R.	—	—	—
" turbo, *d'Orb.*	—	R.	—	—
" valvulata, *d'Orb.*	—	R.	—	—
Truncatulina lobatula, *W. & J.*	R.	R.	—	R.
" refulgens, *Montf.*	—	R.	—	—
Rotalia Beccarii, *Linné*	R.	R.	R.	R.
Polystomella striato-punctata, *F. & M.*	R.S.	V.C.	M.C.	C.
" macella, *F. & M.*	R.	C.	—	—

REFERENCES :—V.C., very common; C., common; M.C., moderately common; R.S., rather scarce; R., rare; V.R., very rare.

Supplemental Notes to the List of Plants, Collected in Central Australia.

(See Part I., pp. 94 *et seq.*)

By Baron Sir F. von Mueller, F.R.S. &c.

[Read October 7, 1890.]

Helipterum Fitzgibboni, *F. v. M.*

West of Eringa and close to Lady Charlotte-Waters; also near the Finke River, Rev. H. Kempe; on Tempe Downs, R. F. Thornton; near the Georgina River, Alfred Henry; on Nullarbor Plains, J. D. Batt; near Mount Moore, Edwin Merrall; at the eastern sources of Swan River, Miss Alice Eaton.

From the Botanic Museum of Melbourne some years ago, under the above systematic name, this plant was distributed, which is dwarf, annual (or at all events flowering from a first year's root), and has broad, linear, bluntish leaves; peduncular elongations of branches are hardly developed. It differs from *H. incanum* in being beset with short glandule-bearing hairlets, in headlets which never attain a large size, in more numerous and more acuminated involucral bracts, the outer of which are dark- or red-brown, ciliolated, and slightly silky, the inner upwards always white, in none of the fruits being attenuated at the summit, and in usually fewer pappus-bristles. Sometimes the involucrating bracts are still more increased on expense of the development of flowers. Horticulturally, this plant is quite distinct from any of the forms of *H. incanum*: nevertheless, it is as yet uncertain, whether it should be regarded as a permanently distinct species or merely as an extreme variety. The broader-leaved form of *H. incanum*, with the usual lanuginous vestiture, penetrates also quite as far as the Tropic of Capricorn into Central Australia, though it is as yet not known from any region of West Australia. In the higher of our Alps, and in many other tracts of country, *H. incanum* produces quite a thick perennial root-stock of considerable length. The whole plant exhales a pleasant, somewhat chamomile-like, odour.

The specific name of this extremely pretty "everlasting" was chosen in honour of E. G. Fitzgibbon, Esq., who for a third of a century has so efficiently held the responsible and onerous office of Town Clerk of Melbourne, and who with genial and enlightened circumspectness has also constantly promoted science-research in the greatest of Southern Cities.

The specimens of *H. Fitzgibboni* from all the localities mentioned are remarkably uniform in their characteristics.

HELIOTROPIUM FILAGINOIDES, *Bentham*, var. *heteranthum*.

Root thin, seemingly annual; leaves flat, from narrow- to elliptic-lanceolar, as well as the branches and calyces hispidulous; some of the corollas enlarged, with semi-lanceolar deltoid glabrous venulous lobes; nutlets four, rounded-blunt, scabrous.

West of Lake Amadeus. (Incorrectly recorded as *H. fasciculatum*). Precisely the same plant near Charlotte-Waters (C. Giles), Yule and Fortescue Rivers (J. Forrest).

The enlarged flowers, which measure across the summit fully a quarter of an inch, seem to indicate a dimorphismus. The genuine *H. filaginoides*, which was gathered by Winnecke near the Mulligan River, differs from our plant in thicker root, silky lanuginous vestiture, corolla much beset with hairlets, and perhaps also in always uniform flowers. Should future researches from ampler material require the separation of the plant here recorded, then the variety name could become specific. In some species of *Heliotropium* (for instance *H. ventricosum*) the base of the fruitlets gets finally so much drawn upwards at the inner side as to render the point of affixion midway-lateral.

ERAGROSTIS TRICHOPHYLLA, *Bentham*.

Bentham (in the "Flora Austral," VII., 643) identifies an *Eragrostis* from Queensland with the *Poa imbecilla* of New Zealand. It is, however, a rather rigid plant, and a genuine *Eragrostis*, while the real *P. imbecilla*, of Forster (but not of R. Brown, who merely re-employed the name for a grass, now referred to *Eleusine Chinensis*), comes nearer to *Poa cæspitosa*, some forms of which are quite as low, thin, and weak as *P. imbecilla*, but the empty bracts of the latter are smaller, and the flower-supporting bracts less streaked.

With Buchanan's excellent illustration ("Indigenous Grasses of New Zealand," pl. liii.) accord well some specimens from Colenso in our collection, except that the five venules of the flower-supporting bracts are shown as more prominent, therefore precisely Poa-like.

LESCHENAULTIA STRIATA, *F. v. M.*

Calyx-tube extending to fully one inch. Corolla inside below its lobes beset with straight-spreading irregularly seriated white hairlets; the two upper lobes linear, acute; the three lower lobes extending considerably beyond the upper, expanding broadly on each side into a bluish venular-striolated imperfectly crisp-ciliolated and somewhat crenulated membrane, the three-lined axis of the lobes shorter than the expansions.

On the Discovery of Marine Deposits of Pliocene Age in Australia.

By Professor Ralph Tate, F.G.S., F.L.S., &c.

[Read August 5, 1890.]

Towards the end of last year a deep bore in search of water was successfully completed at the Australian Smelting Company's Works at Dry Creek, Adelaide. A summary of the beds passed through, which here follows, has been furnished me by Mr. John Provis, the Company's General Manager:—

"The bore was commenced with an auger big enough to take an eight-inch tube, and was sunk 120 feet through clay; after 100 feet had been reached, occasionally thin seams of sand occurred which carried a little water. At 120 feet the tube reached the sand, and a good supply of water was struck, estimated at about 30,000 gallons per day. The sand rose so rapidly, however, that it was impossible to keep it out, and the tube was constantly choked. Owing to the bore being suspended as soon as water was struck, the sand and clay packed so tightly round the tube that it was impossible to drive it, and another tube had to be inserted; this was put down a considerable distance further, in a very fine sand, but eventually shared the same fate. As a last resource, a third tube was inserted, and arrangements were made to carry on the work night and day without intermission.

"A little water began to flow below 300 feet. At about 320 feet we came on to the marine shells, and these continued down to about 400 feet. At 400 feet to 410 feet very few shells occurred, and a little clay was mixed with the sand. There were also occasional pebbles of quartzite and schist. At 400 feet water commenced to flow very freely, and at 410 feet the flow increased to a quantity estimated at 100,000 gallons per day, and continues to-day (July 5, 1890) as strong as when first struck. There is also a marked improvement of the quality of water* now flowing."

The site of the bore is about 14 feet above sea-level, and is at the margin of the Recent Marine silts overlapping the red loams of the Adelaide Plain. The upper 120 feet of the bore-section doubtlessly belong to the Pliocene or Mammaliferous Drift, but until the fossiliferous bed at 320 feet was reached I had not

* See Appendix.

visited the bore. I am, therefore, unable to express an opinion as to the nature and probable age of the intervening portion of the section; moreover, I had not the opportunity of examining any of the extracted material. Particular interest, as regards this geological section, belongs to the fossiliferous sands extending in depth from 320 to 410 feet; because, if I have rightly correlated the fauna here brought to light, we have now knowledge of a marine deposit of Pliocene age, which partially fills the hiatus separating our Older Tertiary series from the Pleistocene and Recent Marine formations.

The sand is very sharp and somewhat coarse; it resembles broken quartz-crystals, and shows little or no attrition. With it there is freely mingled dark-brown or blackish carbonaceous chips, apparently belonging to stout stalks of sea-weed; the dissolved sulphurretted hydrogen in the outflowing water may have originated partly from the chemical action of the decomposing vegetable matter on the alkaline sulphates, whilst some of the animal tissues, which in the form of the ligamental union of bivalve-shells is still preserved in some of the larger species, may have contributed in a like manner. The organic debris consists largely of broken shell-substance; whilst the more or less perfect shells, which also show no signs of extensive rolling, have lost their original lustre; though in one species of *Phasianella* traces of colour are not infrequently clearly discernible, though the original polish has been wholly obliterated. The presence of quartzite-pebbles at from 400 to 410 feet would indicate an approach to the base of the Tertiary series; the pebbles range to about one inch in diameter, and are only slightly eroded.

The fauna comprises 10 species of foraminifera, a coral (*Cyclicia rubeola*, Q. & G.), a few species each of crustacea (*Eliminius simplex*, Darwin, &c.), echinoids (*Goniocidaris*, sp., *Stronglyocentrotus*, sp.), and polyzoa, 60 species of lammellibranchs and 150 gastropods. The species have been carefully compared with Recent and Tertiary forms belonging to Australasia, and less exhaustively with Recent and Tertiary faunas of exotic areas; with the general result that about one-half of the species is peculiar, about 30 per cent. common to the Miocene fauna as known at Hallett's Cove and southward to Aldinga Bay, at Muddy Creek and at the Gippsland Lakes, whilst about 20 per cent. belongs to the recent fauna of Southern Australia. This result would not be anticipated from a cursory survey of the collection, which has a strong modern facies, though the majority of the species after careful comparison prove to be distinct.

Details of the result of a comparison of the Lamellibranchiate fauna with those of the Recent and Tertiary Epochs I am able

to submit, as follows ; whilst as regards the Gastropod-fauna, the comparisons are not completed—the magnitude of the task being disproportionately great, though estimated by so much as has been determined, there are fewer species represented in living creation or in older Tertiary deposits, and a larger number peculiar to the fauna.

Table of the Genera of Lamellibranchiata, with the number of their species belonging to the Pliocene.

Family Gastrochænidæ—			Family Carditidæ—		
Humphreyia	...	1	Cardita	...	2
Family Saxicavidæ—			Carditella	...	1
Saxicava	...	1	Family Nuculidæ—		
Family Corbulidæ—			Nucula	...	1
Corbula	...	1	Leda	...	1
Family Anatinidæ—			Family Crassatellidæ—		
Myodora	...	2	Crassatella	...	1
Myochama	...	1	Family Arcidæ—		
Family Mactridæ—			Limopsis	...	1
Mactra	...	1	Pectunculus	...	2
Hemimactra	...	1	Cucullæa	...	1
Family Tellinidæ—			Arca	...	1
Tellina	...	3	Barbatia	...	1
Family Veneridæ—			Family Aviculidæ—		
Chione	...	6	Meleagrina	...	1
Cytherea	...	2	Family Spondylidæ—		
Rupellaria	...	1	Spondylus	...	1
Family Cardiidæ—			Family Limidæ—		
Cardium	...	2	Lima	...	1
Family Lucinidæ—			Limatula	...	1
Lucina	...	7	Family Pectinidæ—		
Divaricella	...	1	Pecten	...	3
Miltha	...	1	Pleuronectes	...	1
Loripes	...	1	Family Anomiidæ—		
Family Erycinidæ—			Placunanomia	...	1
Lepton	...	3	Family Ostreidæ—		
Pythina	...	1	Ostrea	...	1
Mysella	...	1			—
Cyamium	...	1	Total species	...	60

Table of the Defined Species of Lamellibranchiata, occurring in the Pliocene Sands, showing their Distribution in Time within the Australian Area.

The sign xx before the name indicates that the species is abundant ; x that it is not uncommon. The asterisks in the columns showing distribution indicate that the species are characteristic.

	Eocene.	Miocene.	Pleistocene.	Recent.
Humphreyia Strangei, *Adams*	.	.	.	x
x Saxicava arctica, *Linn.*	x	x	.	x
Corbula ephamilla, *Tate*	*	x	.	.
Myodora brevis, *Sow.*	x	x	.	x
Mactra Hamiltonensis, *Tate*	.	*	.	.

	Eocene.	Miocene.	Pleistocene.	Recent.
xx Hemimactra Howchiniana, *Tate* ...	.	x	.	.
Tellina albinelloides, *Tate*	.	x	.	.
xx Chione striatissima, *Sowerby* ...	.	.	.	x
propinqua, *T.-Woods*, var....	x	x	.	.
subroborata, *Tate*	.	*	.	.
Cytherea submultistriata, *Tate* ...	.	x	.	.
Rupellaria pauperita, *Tate*... ...	.	x	.	.
Cardium tenuicostatum, *Lamk.* ...	.	.	.	x
cygnorum, *Desh.*	.	.	.	x
xx Lucina nuciformis, *Tate*	.	*	.	.
xx leucocomorpha, *Tate* ...	x	.	.	.
fabuloides, *Tate*	.	x	.	.
affinis, *Tate*	.	x	.	.
Tatei, *Angas*...	.	.	.	x
quadrisulcata, *D'Orb.* ...	.	x	x	x
Loripes simulans, *Tate*	.	x	.	.
xx Lepton trigonale, *Tate*	.	.	.	x
Mysella anomala, *Angas*	.	.	.	x
Crassatella oblonga, *T.-Woods* ...	x	*	.	.
Cardita Preissii, *Menke.*	.	x	.	x
x Nucula tumida, *T.-Woods*	x	*	.	.
x Limopsis Belcheri *Adams & Rv.* ...	*	*	x	x
xx Pectunculus obliquus, *Reeve* ...	.	.	x	x
x convexus, *Tate*, var. ...	.	*	.	.
Cucullæa Corioensis, *McCoy* ...	*	x	x	.
Arca navicularis, *Brug.*	.	.	.	x
Meleagrina crassicardia, *Tate* ...	x	x	.	.
Lima Bassii, *T.-Woods*	x	.	.	.
Limatula Jeffreysiana, *Tate* ...	x	.	.	.
xx Pecten anti-australis, *Tate*	.	*	.	.
spondyloides, *Tate*	.	x	.	.
subbifrons, *Tate*	.	*	.	.
Pleuronectes lucens, *Tate*	.	x	.	.
Placunanomia Ione, *Gray*	.	x	x	x
Ostrea Angasi, *Sowerby*	.	.	x	x
Total species, 40.	12	27	6	16

A summary of the distribution of the 60 Pliocene species is as follows :—

Living species	16 or 27 per cent. nearly
Extinct species of the Eocene and Miocene fauna ...	24
Restricted Pliocene species	20
Total	60

Table of the Genera of Gasteropoda, with the Number of their Species belonging to the Pliocene :—

Murex (Chicoreus)	... 1	Vitularia	...	...	1
(Ocinebra)	... 2	Trophon	...	...	1
(Rhinacantha)	... 1	Fusus	...	...	1
(Pteronotus)	... 1	Sipho	...	...	1

Fasciolaria	...	...	2	Odostomia	...	...	2
Triton	...	...	2	Turbonilla	...	...	3
Ricinula	...	...	1	Alaba	...	...	1
Nassa	...	...	3	Lacuna	...	...	1
Cominella	...	...	1	Rissoina	...	...	4
Phos	...	...	1	Rissoia	...	...	3
Voluta	...	...	2	Hydrobia	...	...	2
Ancillaria	...	...	2	Phasianella	...	...	2
Mitra	...	...	3	Eucosmia	...	...	1
Costellaria	...	...	3	Astralium	..	...	2
Columbella	...	...	9	Cyclostrema	...	...	5
Cassis	...	...	1	Teinostoma	...	...	1
Pelicaria	...	...	1	Liotia	...	...	1
Terebra	...	...	1	Cantharidus	...	...	3
Cancellaria	...	...	2	Calliostoma	...	...	1
Marginella	...	...	3	Clanculus	...	...	2
Pleurotoma	...	...	1	Elenchus	...	...	2
Bela	...	...	1	Diloma	...	...	1
Surcula	...	...	1	Solariella	...	...	1
Cithara	...	...	1	Euchelus	...	...	1
Drillia	...	...	1	Haliotis	...	...	1
Clathurella		...	5	Nacella	...	...	1
Cypræa	...	...	1	Fissurellidæa	...	...	1
Crepidula	...	...	2	Fissurella	...	...	1
Trochita	...	...	1	Emarginula	...	...	1
Amalthea	...	...	1	Ringicula	...	...	1
Natica	...	...	5	Tornatella	...	...	2
Sigaretus	...	...	1	Atys	...	...	1
Vermetus	...	...	1	Volvula	...	...	1
Siliquaria	...	...	1	Tornatina	...	...	1
Turritella	...	...	1	Utriculus	...	...	1
Mesalia	...	...	1	Cylichna	...	...	4
Cerithium	...	...	3	Ischnochiton	...	...	1
Campanile	...	...	1	Schizochiton	...	...	1
Bittium	...	...	3	Chitonellus	...	...	1
Triforis	...	...	2	Entalis	.	...	1
Cerithiopsis	...	...	3	Dentalium	...	...	3
Eulima	...	...	1	Cadulus	...	...	1
Syrnola	...	...	3				

Table showing the Vertical Distribution of some Gastropoda occurring in the Pliocene Sands. (Explanations as before).

	Eoc.	Mioc.	Pleist.	Rec.
Nassa Jacksoniana, *Quoy & G.* ...	.	.	.	x
Nassa Tatei, *T. Woods*	*	x	.	.
Cominella subfilicea, *Tate*	.	x	.	.
Triton armatum, *Tate*	x ?	x ?	.	.
xx sexcostatum, *Tate*	.	x	.	.
Ancillaria orycta, *Tate*	.	*	.	.
xx pseudaustralis, *Tate* (dwarfed)	*	.	.	.
Columbella exoptata, *n. sp.*... ...	.	x	.	.
Cassis fimbriatus, *Quoy & G.* ...	.	.	.	x
Pelicaria coronata, *Tate*	.	*	.	.
Cancellaria Wannonensis, *Tate* ...	.	*	.	.
Cypraea Jonesiana, *Tate* ...	.	x	.	.
Crepidula monoxylon, *Lesson* ...	.	x	x	x
immersa, *Anyas*	.	.	.	x

		Eoc.	Mioc.	Pleist.	Rec
	Amalthea conica, *Lamk.*	.	x	x	x
	Natica aurantia, *Lamk.*	.	.	.	x
xx	ovata, *Hutton*	.	*	.	.
xx	gibbosa, *Hutton*	.	*	.	.
	sagittata, *Menke*	.	.	.	x
xx	Mesalia Provisi, *n. sp.*	.	x	.	.
xx	Cerithium tenue, *Sow*	.	.	.	x
xx	Potamides dubium, *Sow.*	.	.	.	x
	Rissoina lirata, *Angas*	.	.	.	x
	Rissoina elegantula, *Angas* ...	.	.	.	x
	Cyclostrema micra, *T. Woods* ...	.	.	.	x
	Liotia Angasi, *Crosse*	.	.	.	x
	Elenchus irisodontes, *Quoy & G.* ...	.	.	.	x
	Euchelus Tasmanicus, *T. Woods* ...	.	.	.	x
	Haliotis nævosa, *Reeve*	.	.	.	x
	Fissurella scutella, *Gray*	.	.	.	x
	Emarginula candida, *Reeve*	.	.	.	x
	Utriculus eumicrus, *Crosse*	.	.	.	x
	Volvula rostrata, *A. Adams* ...	.	.	.	x
	Cylichna pygmaea, *A. Adams* ...	.	.	.	x
	Dentalium elephantinum, *Lin.* ...	.	.	.	x
	octogonum, *Lamk.* ...	.	.	.	x
x	Entalis sectum, *Deshayes*	.	.	.	x
	Cadulus acuminatus, *Deshayes* ...	.	x	.	x

List of Species of Foraminifera from the Dry Creek-Bore, determined by Mr. W. Howchin, F.G.S.

Rotalia Beccarii, *Linn.* Common; fine examples.
Polystomella crispa, *Linn.* Rather scarce and small.
subnodosa, *Münst.* Common; fine examples, carinate and conspicuously umbonate.
Discorbina turbo, *D'Orb.* Rather scarce.
rosacea, *D'Orb.* Rather scarce.
Truncatulina lobatula, *W.* and *J.* Very rare.
Miliolina Ferussacii, *D'Orb.* Very rare.
oblonga, *Montag.* Very rare.
(Triloculina) tricarinata, *D'Orb.* Rare.
Biloculina bulloides, *D'Orb.* Very rare.

The above are all shallow-water species, and each has been noted in one or other of the Muddy Creek-beds; but the list is much more characteristic of the Upper Bed (Miocene) than the Lower (Eocene).—W. H.

I have already stated that the fauna has a strong modern facies, but at the same time it does not materially differ in its generic grouping from that of our Miocene, which presents so many points of contrast with the Eocene. The only genera of special interest are *Lacuna* and *Cyamium*, both now known for the first time as constituents of a Tertiary fauna in Australia, and as yet unknown in its recent one. The former belongs to

the Palæarctic fauna, though well represented in the Parisian Eocene. It is remarkable that it is here represented by a species so closely near to *L. pallidula* as to cause hesitation to inscribe it under a different denomination. One is almost tempted to place it in the same category as *Saxicava arctica*, *Lasaea rubra*, and a few others which are common to the temperate seas of both hemispheres. *Cyamium* is Palæo- and Neo-arctic, though known by one species in the Paris-Basin.

A fact of some significance, suggestive of a colder climate prevailing during this life-epoch, as compared with the Miocene on the one hand and the Recent Period on the other, over the same areas, is the large proportion of diminutive shells, either in regard to the genera to which the species belong, or in regard to identical species of older or recent date. This is very conspicuous in the genera *Columbella*, *Phasianella*, and *Chione*, and exemplified by the species *Corbula ephamilla*, *Arca navicularis*, *Hemimactra Howchiniana*, *Cucullæa Corioensis*, *Ancillaria pseudaustralis*, *Pelicaria coronata*, &c., whilst on the other hand *Saxicava arctica* attains to large dimensions, as in forma *Angasi*.

The fauna is certainly distinct from the Older Miocene, as known at the localities previously named, and is a new one for Australia. In its higher percentage of living species it occupies an intermediate place in the scheme of geological periods between the Miocene and the Recent; and though I provisionally employ the stratigraphical designation of Older Pliocene for it, I am fully aware that the proportion of living species is too low to justify its employment as measured by the European standard; yet in this case the percentage-principle of classification does not adequately express the modern complexus of the whole fauna.

The majority of the living species range from low-water mark to five or six fathoms in depth. Most certainly the fauna belongs to the shallow water. The sharp sands and the fragmentary and unrolled condition of the fossils are rather suggestive of shallow-water material having been swept into a depression of the sea bed, or perhaps indicative of rapid accumulation on a sinking bottom.

The general elevation of the fossiliferous Miocene skirting the east coast of Gulf St. Vincent is about 80 feet above sea level; so that there is a difference of level of about 500 feet between the marine equivalents of the Miocene and Older Pliocene. The Older Pliocene fossil-bed is at from 320 to 410 feet in the Dry Creek bore, which is equal to 306 to 396 feet below sea level, and if we deduct 36 feet as the probable depth at which the species lived, then there has been a general depression of the coast-line

since the Older Pliocene period of 360 feet. The opinion that this deposit has been thrown by a fault is hardly worthy of consideration; though it is absolutely demanded if the extreme view is held that the Dry Creek deposit is synchronous with the Miocene, the nearest site to which is in the city of Adelaide, five miles distant, at an elevation of 110 feet above sea-level.

The above estimate of movement closely accords with those founded on other data, namely, the extension of the Mammaliferous Drift below sea-level, to which I have appealed as some warranty for the opinion that elevation was a factor in climatic change during the time when glaciers existed in the southern part of Australia. The following quotation is significantly applicable:—"I am unacquainted with marine Pliocene beds in South Australia, or even in Australia, ... therefore the marine equivalents to the Pliocene [Mammaliferous] Drift, if extant, are submarine." Arguing on the lacustrine origin of the Pliocene Drift, and its extension below sea-level, as evidence of the depression of the land since then, reference is made to the Pliocene Drift at Port Wakefield extending to 312 feet below sea-level, and overlying Cambrian or Pre-Cambrian strata; at Port Augusta to 356 feet below sea-level (but the base not reached). R. T., in Trans. Roy. Soc., S. Aust., vol.

Appendix.

Analysis of water from the Dry Creek-Bore. By Professor Rennie, D.Sc., &c.

In parts per 100·000.

Total solids dried at 180 deg. C.	321·
After ignition and restoration of carbonates ...	302·50
Sodium	83·90
Potassium	3·06
Calcium	16·28
Magnesium	10·85
Iron	·23
Aluminium	·21
Silica (SiO_2)...	2·7
Chlorine	119·15
Sulphuric acid (SO_4)	48·45
Phosphoric acid (PO_4)	*nil*
Total carbon dioxide (CO_2)	40·00
*(Free or semi-combined CO_2)	16·27
Sulphurretted hydrogen (SH_2)	·80

* Calculated.

These may conveniently be supposed to be combined as follows, but it must be clearly understood that such combinations are to a large extent arbitrary, there being no known method of ascer-

taining with certainty how the acids and bases are combined in the original water :—

Parts per 100·000.

Potassium chloride	5·845
Sodium chloride	191·758
Sodium sulphate	26·276
Magnesium sulphate	38·357
Magnesium carbonate... ...	11·126
Calcium carbonate	40·700
Oxide of iron (Fe_2O_3) ...	·335
Alumina	·315
Silica	2·700
	317·407

This takes no account of organic matter, which is present in sufficient quantity to blacken the residue on ignition.

The Stratigraphical Relations of the Tertiary-formations about Adelaide, with especial reference to the Croydon-bore.

By Professor Ralph Tate, F.G.S., F.L.S., &c.

Plate IV.

[Read October 9, 1890].

Not many weeks since a bore was commenced at Croydon, three and a-half miles from Adelaide; but at the present date operations have been suspended, when a depth of 800 feet was reached. Whether the boring will be resumed is not yet decided on; but it is earnestly hoped, in the interest of geologic science, and to the attainment of the fullest knowledge of the water-bearing capabilities of the formations underlying the Adelaide-plain, that the bore will be extended into the Archæan rocks, which is necessary to ensure a certain measure of finality as regards the scientific as well as the utilitarian aspect of the exploration.

The geological information hereby gained is supplementary to the foregoing communication on the Dry Creek-bore; and because of this it is deemed undesirable to postpone the publication of

the facts on the uncertain chance of the resumption of boring operations.

The main stratigraphical features, summarised from the boring account (kindly furnished by the Conservator for Water, and herewith appended), are introduced in the accompanying section, Plate IV., which represents in the fullest manner the stratigraphical relationships of the various formations of the Tertiary Period in South Australia; the eastern part of the section has already been published, Trans. Roy. Soc., S. Aust., vol. V., pl. 1, p. 40, 1882, and is here added for the sake of completeness. The section shows that the Old Tertiaries (Eocene and Miocene), underlying the City of Adelaide, crown a steep escarpment of Archæan rocks, against which have been deposited in succession the marine beds of the Older Pliocene and the Mammaliferous Drift; whilst at Port Adelaide, recent marine deposits margined by sand-dunes, resting unconformably on the Mammaliferous Drift, mark a post-tertiary shore-line; and finally modern sand-dunes line the present shore.

The Section affords clear evidence of a time-interval between the Miocene and Older Pliocene; and induces me to remark that a closer study of "erosive surfaces" among our Tertiary beds will prove of high value in determining their relative ages and check the conclusions drawn from palæontological data alone. The remarkable diversity of sedimental conditions and concurrent faunal changes within the same geologic basin may lead us to incorrect conclusions if we do not admit that palæontology is based wholly on stratigraphy.

The superposition of the dissimilar Miocene-fauna on the Eocene is in most localities unaccompanied by any visible stratigraphical break; feebly so, however, at Muddy Creek, but in this case the palæontological conclusions led up to the recognition of an interruption in the succession of deposits. However, the stratigraphical break is most pronounced in the maritime tract in mid-southern Gippsland, where the Miocene-beds are laterally in juxtaposition with Eocene-strata, which rise to much greater altitudes—a relationship analogous with that of the Newer and Older Tertiaries at Adelaide as exhibited in the present Section.

Thus all the grander groups, Eocene, Miocene, Older Pliocene, and Pleistocene, are separable on stratigraphical data; and when these are obscured or not determinable, then our knowledge of the fauna of each, when sufficiently varied and well-developed, will enable us to identify geological horizons within the same geological basin or probably in contiguous ones.

Mammaliferous Drift.

At several localities, within two and three miles of Croydon, the clayey loams and associated gravels that form the more superficial deposits of this horizon have yielded species of extinct Mammalia—of *Diprotodon*, *Palorchestes Azael*, *Phascolomys*, &c.

At about the position indicated on the Section, carbonaceous debris was obtained, some years ago, at a depth of 50 feet; on this bare fact, an appeal is made to speculators to invest capital in a search for coal at this place. The comparatively recent geological age of the Mammaliferous Drift had been early proved by me by the discovery of chalky limestone-pebbles, containing the Eocene-species, *Turritella Aldingæ*, in the loams forming the cliffy banks of the River Torrens near the present Weir, whilst later discoveries of mammalian debris in the same deposit have settled the relative position of this geological horizon. Having in view the age of the deposit, its limited vertical depth, and its restricted area on the east, as made certain by the data derived from the Croydon-bore, there seems to me very little hope of any useful purpose to be served by sinking in it in search of coal, unless it be to supply the exact position of boundary-lines between the successive formations, instead of the conjectural ones of my section.

The details of the nearly 400 feet of Mammaliferous Drift passed through in the Croydon-bore are appended. The base of the formation has been fixed at the first marine bed, though a higher position may have been selected on lithogical considerations; seeing that the main mass of the Older Pliocene consists of sharp sands and those at 380 feet closely resemble an Æolian formation, it may be questionable if the beds from 350 to 395 feet should not be included in the Older Pliocene.

Older Pliocene.

The Croydon-section supplies very detailed information as to the thickness and nature of the beds passed through; the official record I have in part revised, as the outcome of a careful examination of the material submitted to me. In these particulars, the Dry Creek-bore was deficient, though on the other hand the palæontological data furnished by the Croydon-bore are meagre, probably because of the very much less quantity of material available. Nevertheless the small collection of fossils, which has been gathered, proves that the Dry Creek shell-bed was reached in the Croydon-bore at about the same horizon, 340 feet below sea-level.

Some species additional to those obtained from the Dry Creek-bore occur, but they do not affect the general palæontological

conclusions previously arrived at. It seems needless to furnish a list of the species, as I hope at an early date to examine exhaustively and report upon the fauna as a whole.

Below the chief shell-deposit, from 395 to 450 feet, species of mollusca prove to be rare and in a fragmental condition. The few forms which seem largely to make up the more calcareous portions, included within the depths of 605 and 738 feet, afford no very trustworthy index to age, of these *Ditrypa Wormbetensis*, McCoy, which is the most abundant, has hitherto been known to me only from undoubted Eocene-beds, but as it is associated in the higher levels of the Croydon-bore with some determinable fragments of the characteristic mollusca of this formation, it must be conceded that this dentaloid annelid is a survival from Eocene times.

The great thickness of the Older Pliocene, 406 feet at the least, is unexpected, as I had conjectured that its base was near-approached in the Dry Creek-bore at a level corresponding with the superior beds only passed through in the Croydon-bore; but admitting the correctness of the assumption, then, the new facts simply indicate a great inequality of the floor on which the Older Pliocene deposits have accumulated.

SECTION OF THE STRATA PASSED THROUGH BY THE CROYDON-BORE.

"MAMMALIFEROUS DRIFT."

Depth in feet below surface (56ft. above sea-level).	Nature of strata.	Remarks.
to 10	Brown clayey loams.	
10 " 18·5	Brown clay.	
18·5 to 19	Brown sandy clay.	
19 " 45	Brown clay.	
45 " 57	Coarse quartzose sand and gravel.	
57 " 75	Clay and gravel.	
75 " 95	Brown clay.	
95 " 110	Clay with limestone-nodules.	
110 " 212	Brown clay.	
212 " 215	Grey clay.	
215 " 235	Clay and quartz gravel.	Water at 215ft. rising to 30ft.
235 " 260	Yellow clay and sand.	Water at 245ft. from surface
260 " 295	Brown clay.	
295 " 315	Brown clay and quartz-gravel.	
315 " 320	Brown clay.	
320 " 325	Brown sand.	
325 " 330	Brown clay.	
330 " 350	Light-brown sandy clay.	
350 " 378	Yellow sand.	
378 " 382	Yellow sand with calciferous lumps.	
382 " 385	Light-grey sharp sand.	
385 " 395	Greenish-grey and brown clay.	

"OLDER PLIOCENE."

Depth in feet below surface (56ft. below sea-level).	Nature of strata.	Remarks.
395 " 415	Grey sharp sand, with small angular gravel and shell-chips	*Ostrea Angasi, Pectunculus obliquus, P. convexus, Limopsis Belcheri, Crassatella oblonga, Mesalia Provisi, Cassis fimbriatus; Orbitolites complanatus.*
415 " 416	Hard blue calcareous sandstone, with shells.	
416 " 430	Grey sharp sand, with shell-chips.	
430 " 435	Greyish-brown sharp sand, with small shell-fragments.	*Pectunculus obliquus.* Small gastropods.
435 " 450	White, medium-grained, fairly well-rounded sand, mixed with sharp shell-debris.	Only small mollusca entire, some with colour; *Laganum; Orbitolites*, abundant.
450 " 455	Black and grey, fine sand; shell-chips rare.	*Ostrea Angasi.*
455 " 470	Grey sharp sand, with small angular gravel and shell-chips.	*Carditta Preissi, Cucullæa Corioensis, Limposis Belcheri, Lucina quadrisulcata, Ostrea Angasi, Pelicaria Mesalia Provisi; Cassis fimbriatus, Crassatella oblonga, Meleagrina crassicardia*
470 " 500	White sharp sand, with small sharp gravel and broken shells	
500 " 520	Greyish-brown sharp sand, with small shell-fragments.	
520 to 525	Shelly gravel, with white sand.	Fragments of large *Celloporæ* abundant.
525 " 550	Very fine grey sand; shelly chips very rare.	
550 " 570	Fine, grey, sharp sand, with some shell-debris.	*Ostrea, Spondylus, polyzoa; Ditrypa* (*common*).
570 " 572	Fine grey sand-rock, with much comminuted shell-debris.	*Natica balteata, Corbula ephamilla, Ostrea Angasi, Ditrypa, Echinus.*
572 " 595	Very fine grey sand.	
595 " 605	Fine grey sand and sand rock and shelly fragments.	*Ostrea, Cucullæa, Pecten antiaustralis, P. spondyloides, Lucina quadrisulcata, Siliquaria, Turritella, Ditrypa, Echinus, Laganum.*
605 " 655	Yellow gritty calcareous sand.	Water at 630ft., rising to 20ft. from surface.
655 " 720	Yellowish-grey calciferous sand and sand-rock.	Foraminifera; fragments of polyzoa, echinoids and *Ditrypa.*
720 " 795	Very tenacious blue clay, with foraminifera and small nests of iron-pyrites.	
795 " 800	Sandstone.	

The Gastropods of the Older Tertiary of Australia. (Part III.)*

By Professor Ralph Tate, F.G.S., F.L.S.

[Read October 7, 1890.]

FAMILY TRICHOTROPIDÆ.

The ten species of this family forming part of the Eocene fauna of Australia are all congeneric; but I am uncertain as to their correct location—whether with the type genus or with *Mesostoma*.

Mesostoma was defined by Deshayes in 1864, and included in it four species from the Parisian Eocene; the genus was referred to the Family Rissoidæ. In my Appendix to Woodward's Manual of the Mollusca, 1867, I ventured to transfer it to the Family Cerithiidæ, in which arrangement I am followed by Tryon in his Systematic Conchology, 1883. In my "Census of the Fauna of the Older Tertiary of Australia," Roy. Soc., N.S. Wales, October 3, 1888, I referred our species to "*Mesostoma* (if distinct from *Trichotropis*)," and was disposed to regard *Trichotropis inornata*, Hutton, recent and fossil in New Zealand, as congeneric therewith. Dall, in his Report of the "Blake" Mollusca, Part II., June, 1889, places *Mesostoma* as a subgenus under *Trichotropis*, without, however, indicating the differential characters; but remarks that "the degree of affinity which *Mesostoma*, *Dolophanes*, &c., bear to the original type of the family yet remains to be determined."

So far as my own investigations permit me to form an opinion, I fail to appreciate any differences of generic value, from a conchological point of view, between *Trichotropis* and *Mesostoma*.

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* In the natural sequence of the families, Marginellidæ, Columbellidæ, and Pleurotomidæ should have formed part of this or the preceding fasciculus; but because of the difficulty experienced in correctly illustrating the species of the first two families, which are for the most part small or minute, their inclusion has for the present been abandoned. In respect of the Family Pleurotomidæ, the cause of their temporary exclusion is want of leisure to elaborate the very numerous species (not less than 60) of this perplexing group.

Eleven species of *Marginella* have been described, though not figured; of *Columbella*, represented by about 26 species, very few are diagnostically known; but of Pleurotomidæ about 20 have been described, and about half of them figured.

The plates to illustrate this communication are unavoidably postponed.

The family is represented by 24 living species, two of which antedate to Pliocene times; by 15 Eocene species, 4 of the Paris-basin, 1 from Alabama, and 10 herein described.

Genus Trichotropis.

synopsis of species.

Spire-whorls medially angulated. 1. *T. angulifera.*
Spire-whorls flattened or sloping behind.
Costated, liræ crenulated; outer lip lirate.
2. *T. tabulata.*
Transverse and spiral ornament of fine threads.
3. *T. subquadrata.*
Spire-whorls rounded.
Spirally lirate, transverse ornament not prominent.
Liræ 3, pullus lirate; outer lip sulcate within.
4. *T. triplicata.*
Liræ 5, pullus smooth; outer lip smooth within.
Whorls rapidly increasing, liræ equal.
5. *T. accrescens.*
Whorls slowly increasing, medium lira prominent.
6. *T. quinquelirata.*
Liræ 10 or more, pullus and outer lip lirate.
Liræ equal. 7. *T. apicilirata.*
Liræ alternately stout and slender.
8. *T. interlineata.*
Spirally lirate and conspicuously costate.
Liræ many slender, pullus obscurely lirate.
9. *T. costata.*
Liræ 4 prominent, pullus lirate. 10. *T. fenestrata.*

The species may be arranged into two sections, according to whether the embryonic whorls be ornamented or not. Section I., in which the embryonic whorls are lirate, contains *tabulata*, *subquadrata*, *triplicata*, *apicilirata*, *interlineata*, *costata*, *fenestrata*; Section II., with smooth embryonic whorls, includes *angulifera*, *accrescens*, and *quinquelirata*. There are no close alliances with Parisian species, though *T. triplicata* presents some analogy with *Mesostoma grata*, Desh., and *T. angulifera* has a distant resemblance to *M. angulata*, Desh.

1. Trichotropis angulifera, *spec. nov.*

Shell minute, thin, slenderly fusiform, imperforate. Whorls six; spire elevated, ending in a prominent obtuse apex consisting of two smooth whorls, the first of which is relatively small subglobose, with tip centrally immersed.

Spire-whorls three, medially angulated, the periphery defined by a broad flat rib, between which and the anterior suture are

two equal and equidistant narrow flat liræ; the posterior slope is spirally striated, with or without an inconspicuous medial thread; the whole surface is traversed by close-set sigmoid striæ of growth, and at regular distant intervals by raised threads, which produce slight denticulations as they pass over the peripheral angulation.

Last whorl truncatedly carinated at the periphery; its posterior slope is transversely close-striated and feebly costated (costulæ about 12), and further ornamented by one or two slender, more or less medial, spiral threads; the base has about six encircling flat threads, separated by about equally wide sulci, crossed by close-set striæ.

Aperture acutely oval, channelled in front; outer lip thin, smooth within; columella-pillar very prominent, arched; inner lip slightly reflected near the front.

Dimensions.—Length, 4·0; greatest breadth, 2·0; height of aperture, 1·75.

Locality.—Eocene; glauconitic clayey sands, Adelaide-bore (2 exs.).

2. Trichotropis tabulata, *spec. nov.*

Shell small, thin, broadly fusiform, imperforate; whorls six and a-half; spire conical, scalar, ending in a blunt apex of two and a-half lirate whorls, the first of which is relatively very small.

Spire-whorls three, of rather rapidly-increasing width, with a flattish shoulder and angled in the posterior two-thirds, anterior to which they are convex; the suture is deep. The spiral ornamentation consists of two equal and equidistant threads on the posterior area; and of four elevated, equal, equidistant and somewhat undulose threads, crenulated on the edge, which occupy the anterior convex area; the posterior lira forms the peripheral angulation; on the anterior whorls a more or less slender thread is interposed between the third and fourth. The transverse ornamentation consists of broad subacute costa-like folds on the front of each whorl (about 15 on the penultimate), continued very obliquely to the posterior suture as depressed undulations; and of rather distant coincident striæ of growth, which produce crenatures as they pass across the liræ.

The body-whorl is broad and short, rather tumid, with a rounded convex base, which contracts rapidly into a very short triangular beak. The ornamentation is like that of the spire-whorls, except that there are several threads (seven or eight) on the posterior slope, and that the convex medial area has a slender thread alternating with the liræ; the base is ornamented with concentric threads alternately large and small.

Aperture rhomboid-oval, shortly channelled in front; outer lip thin, strongly lirate within; inner lip reflected, nearly covering the umbilical chink.

Dimensions.—Length, 7·0; greatest width, 4·0; height of aperture, 3·0.

Locality.—Eocene; glauconitic clayey sands, Adelaide-bore (6 exs.).

3. Trichotropis subquadrata, *spec. nov.*

Shell small, thin, fusiform, subumbilicated; whorls five; spire conical, rather high, scalar, ending in a blunt apex of two lirate whorls, the first one of which is relatively small.

Spire-whorls two, with a sloping shoulder and angled post-medially, anterior to which they are slightly convex. The spiral ornamentation consists of four slender subacute threads on the posterior area, of four stouter equidistant threads on the anterior area, sometimes with a supplemental one in front of the posterior thread, which is at the peripheral angulation. The transverse ornamentation consists of oblique thread-like costulæ, with two or three finer threads in the interspaces; the intersections of the spiral and transverse threads produce a very conspicuous and regular tessellated ornament.

The body-whorl is broad and short, rather tumid, with an anterior and posterior angulation, between which it is slightly convex; the base is flatly convex, and contracts very rapidly. The spiral ornament consists of four threads above, six stouter ones in the median portion and three on the base; the transverse ornament consists of slender costulæ, which are directed backwards on the posterior area, incurved on the median area and ecurved on the base; the liræ are slightly denticulated at their intersection with the costulæ; the interspaces are traversed by two coincident raised lines.

The aperture is rhomboid-rotund, inconspicuously channelled at the front; the outer lip is thin on the edge and smooth within; the inner lip is medially incurved, slightly reflected, but not concealing the long narrow umbilical chink.

Dimensions.—Length, 3·5; greatest width, 2·8; height of aperture, 1·5.

Locality.—Lower beds (Eocene) at Muddy Creek (4 exs.).

This species, which is founded on what are probably immature specimens, has a general resemblance to *T. tabulata*, from which it differs conspicuously in its neat tessellated ornament.

4. Trichotropis triplicata, *spec. nov.*

Shell small, thin, imperforate; whorls four and a-half, convex; spire short, conical, ending in a blunt apex of two lirate whorls.

Spire-whorls convex with three strong, equal, equi-distant, truncated liræ, with a fourth partially concealed at the anterior suture, crossed by arched costulæ which produce slight nodulations on the liræ, and by lamellæ of growth two or three in each

interspace, the lamellæ appear as slight subimbricating squamæ on the liræ.

Body-whorl short and broad, ornamented with four strong liræ and otherwise as the spire-whorls; the base is abruptly contracted, flatly convex and ornamented with four concentric threads, the two outer ones distantly separated, the two inner ones approximate. Aperture quadrately rotund, attenuated in front to a slight channel; outer lip thin, crenulated on the edge and deeply sulcated within corresponding with the external liræ. Columella slightly arcuate, with the inner lip reflected and almost concealing the umbilical chink.

Dimensions.—Length, 3·5; greatest width, 2; height of aperture, 1·5.

Locality.—Eocene; glauconitic clayey sands, Adelaide-bore (1 ex.).

5. Trichotropis accrescens, *spec. nov.*

Shell of moderate size, imperforate, whorls seven, convex, much narrowed at the sutures; spire elevated, ending in a blunt apex of one and a-half smooth inflated whorls.

Spire-whorls convex, rapidly increasing in width, with five strong equal and equidistant elevated truncated liræ, with a sixth partially concealed at the anterior suture; crossed by stout, arched threads, about equal in breadth to the interstitial angular furrows, about 10 in a breadth of 1 mm. on the penultimate whorl.

Last whorl convex, gradually contracted at the base into a very short beak, ornamented with about 10 raised truncated threads and transversely by arcuate striæ. Aperture quadrately rounded; outer lip thin, smooth within; columella nearly straight, inner lip reflected, almost concealing the umbilical chink.

Dimensions.—Length, 11·5; greatest breadth, 5·5; height of aperture, 4·5.

Locality.—Lower beds (Eocene) at Muddy Creek (2 exs.).

6. Trichotropis quinquelirata, *spec. nov.*

Shell of moderate size, rather thick, turriculate, imperforate; whorls seven, convex, of slow increase, medially subangulated, ending in a blunt apex of two smooth convex whorls.

Spire-whorls four; spirally ornamented with five equidistant, raised, truncated liræ, the medial one is stouter than the others and forms a subangulated periphery; transversely ornamented by fine, close-set, regular, slightly oblique striæ.

Body-whorl narrow and long, rapidly but not abruptly narrowed at the base; ornamented with about 12 truncated cingula,

separated by one and a-half to two times wider, flat, transversely striated furrows.

Aperture roundly oval, channelled at the front; outer lip smooth within; columella slightly arched, inner lip reflected, quite concealing the umbilical chink.

Dimensions.—Length, 6·5; greatest width, 3·0; height of aperture, 2.

Locality.—Eocene; glauconitic calciferous sand-rock, Bird-rock Bluff, Spring Creek, near Geelong (1 ex.).

7. Trichotropis apicilirata, *spec. nov.*

Shell of moderate size, rather thin, turriculate, imperforate; whorls seven and a-half, of gradual increase, convex or medially subangulated, ending in a subacute apex of two and a-half, small, convex, lirate whorls.

Spire-whorls four; the spiral ornament consists of about ten narrow threads, five on the posterior area are unequal and irregularly disposed, the four on the front are stouter, equal and equidistant, the posterior one of which forms a slight angulation, especially on the posterior whorls; the transverse ornament consists of oblique equidistant threads producing a rhomboidal tessellation by intersection with the spirals which are slightly crenulated.

Body-whorl rounded with six irregular spirals on the posterior slope, five prominent ones on the medial area, and five irregular ones on the short, flattish, subangulated base; the whole surface crossed by sigmoid threads.

Aperture rotund, channelled in front; outer lip thin; columella nearly straight, inner lip reflected.

Dimensions.—Length, 9·75; greatest breadth, 4·5; height of aperture, 3·0.

Localities.—Bird Rock Bluff, Spring Creek; blue clays Schnapper Point (2 exs.).

8. Trichotropis interlineata, *spec. nov.*

Shell of moderate size, rather thick, turriculate; whorls convex spirally lirate and transversely closely striated, embryonic whorls lirate.

Spire-whorls three, convex, slightly flattened at the posterior suture: spirally ornamented with about 12 liræ, alternately large and small, which are minutely serrated by regular, close-set, oblique striæ.

Body-whorl convex, rather tumid, with a regularly convex base; ornamented with subacute spiral threads, alternately large and small, crossed by arched striæ.

Aperture rotund, rather broadly channelled at the front; outer

lip lirate within ; columella concave behind, a little twisted towards the front, inner lip reflected, almost concealing the umbilical chink.

Dimensions.—Length, 7·0 ; greatest breadth, 4·0 ; height of last whorl, 2·5 nearly.

Locality.—Eocene ; glauconitic sands, Adelaide-bore (3 exs.).

9. Trichotropis costata, *spec. nov.*

Shell of moderate size, thin ; whorls of rather rapidly increasing width ; spire broadly conical, ending in an obtuse apex of two and a-half obsoletely trilirate whorls.

Spire-whorls two, medially subangulated ; spiral ornamentation of three slender rounded threads on the posterior slope, and about six alternately large and small anterior to the peripheral angulation ; the transverse ornamentation consists of oblique convex costæ, narrower than the convex interspaces, and of regular striations, which produce the appearance of fine punctations in the spiral furrows.

Body-whorl convex, a little tumid, subangulated at the base, ornamented with minutely serrated liræ, alternately large and small, about eight on the posterior slope, about twelve above the basal angulation, and about ten on the base. The transverse ornamentation consists of about ten arched costations, which are evanescent at the basal angulation, and of coincident striæ.

Aperture rotund, obliquely channelled at the front ; outer lip obscurely lirate within ; columella-lip reflected, almost concealing the umbilical chink.

Dimensions.—Length, 5·0 ; greatest breadth, 3·0 ; height of aperture, 2·0. A fragment has a diameter of last whorl of 4·5.

Locality.—Eocene ; glauconitic sands, Adelaide-bore (4 exs.).

10. Trichotropis fenestrata, *spec. nov.*

Shell small, thin, turriculate ; whorls five, of slow increase, separated by a channelled suture, terminating in a blunt apex of two convex lirate whorls, the tip relatively very small.

Spire-whorls two, moderately convex, ornamented with four equal, equidistant, very prominent liræ, crossed by equal, equidistant, straight costulæ of about equal strength to the liræ ; the rectangular intercostal spaces with about three or four transverse threadlets. The intersections of the liræ and costulæ are more or less denticulated.

Body-whorl regularly convex, high and narrow, encircled with about twelve principal liræ, with an intermediate threadlet between the medial liræ ; the costulæ are acute, separated by broad shallowed interspaces, about fifteen in number, the anterior ones of which are continued on to the base ; the intercostal spaces with from four to five coincident threadlets.

Aperture roundly-oval, channelled at the front; outer lip smooth within; columella-reflection concealing the umbilical chink.

Dimensions—Length, 3·75; greatest breadth, 2; height of aperture, about 1·0.

Locality.—Eocene; glauconitic sands, Adelaide-bore (2 exs.).

FAMILY SEQUENZIIDÆ.

Genus Sequenzia, *Jeffreys* (1876).

The genus includes certain small trochiform shells, thinly nacreous, with an infra-sutural sinus resembling that of some Pleurotomiidæ, a sharp and shallow sinus at the periphery, and a third, more open, at the base; the columella is more or less twisted, with an anterior tooth-like projection; the base is either deeply umbilicated or imperforate. Eight species are known from off Pernambuco, and in tropical and subtropical latitudes on both sides of the North Atlantic at depths ranging from 100 to 1,500 fathoms. One of the living species occurs in the Upper Miocene of Calabria and in the Middle Pliocene of Sicily.

The author of the genus placed it near *Solarium*. Tryon in his Manual of Conchology (1883) includes it among Pleurotomariidæ in the vicinity of *Scissurella*. It forms part of Tryon's Monograph of the Family Trichotropidæ. Prof. Verrill removed it, on anatomical characters, far from its former assigned positions, and made it the type of a distinct family. Watson, Challenger Rep. Gastr. (1886), retains it among the Trochiidæ. Dall, Blake Rep. Gastr. (1890), follows Verrill, and places the family in the neighbourhood of Trichotropidæ.

The presence of the genus in the Older Tertiary deposits of Australia was notified by me in Proc. Roy. Soc. N.S.W., 1888, pp. 243, 249; it is represented by a single species which differs from all others by the crenulated margin to the umbilicus and by the bisinuated base of the aperture, as well as by the strongly developed radial ornamentation.

Sequenzia radialis, *spec. nov.*

Shell small, thin; broadly conical; flat and sharply angulated at the base, perspectively umbilicated; ornamented by radial sigmoidal threads, latticed by spiral ones.

Whorls seven, those of the spire flat, with the peripheral angulation exsert, or varying to biangulated, ornamented by equal, equidistant, sigmoid and radial lamelliform threads, and above the peripheral angulation by about four equal equidistant spiral threads, the intersections producing square- to rhomboid- interspaces. The radial lamellæ are more or less continuous from

whorl to whorl, and the suture is consequently usually concealed; there are about 10 in 1 millimetre-space on the penultimate whorl.

Body-whorl with about five spiral threads crossed by the radial lamellæ above the periphery; the peripheral angulation is formed of two approximate large exsert threads, with a small thread on the outside of each. The base is flat, with eight encircling threads, the first two or three narrower than the sulci, the others crowded; the whole surface tessellated by radial threads. The umbilicus is wide and perspective, margined by about sixteen stout granulations, from which proceed the radial threads in twos and threes.

Aperture rhomboid, peristome completed by a thin nacreous growth. Outer lip roundly insinuated near the suture between the first and third spiral threads; sharply and shortly notched at the posterior carina; at the exterior of the base roundly insinuated, separated by a similar sinus at the inner angle by a tubercle corresponding with umbilical carina.

Columella oblique, thickly rounded and slightly reverted on the edge, with a broad deep sinus above; a strong twisted projection tooth at about two-thirds of its length, below which is the inner basal sinus.

Dimensions.—Height, 2·75; greatest breadth, 3·00; height of aperture, 1·25.

Locality.—Eocene at Muddy Creek (9 examples).

This species is simulated by an undescribed *Basilissa* of the Family Trochiidæ, obtained from the Eocene sands in the Adelaide-bore; the latter is generically distinguished by its thick nacreous test, by the absence of the sharp tooth of the columella, and has only a sutural sinus.

FAMILY CONIDÆ.

Genus Conus.

SYNOPSIS OF SPECIES.

Spire flat, or nearly so.

Pullus small.

No spiral ornament; pullus acute. 1. *C. cuspidatus.*

Spiral threads, wavy-wrinkled transversely. 2. *C. ptychodermis.*

Spiral rows of flat granules. 3. *C. complicatus.*

Spiral linear-grooved. 6. *C. heterospira*, var.

Pullus large, obtuse; body-whorl more or less spirally striated. 4. *C. pullulescens.*

Spire short, scalar.

Peripheral angle margined ; posterior slope flat or concave. 5. *C. ligatus.*

Peripheral angle not margined ; shoulder sloping backwards. 6. *C. heterospira.*

Spire moderate, with an uninterrupted slope.

Suture of spire-whorls crenulated ; body-whorl smooth. 7. *C. Ralphii.*

Suture concealed ; body-whorl with spiral rows of granules. 8. *C. acrotholoides.*

Spire moderate, the whorls slightly angulated.

Pullus small, subacute, the tip obliquely immersed.

Body-whorl spirally sulcate; posterior spire-whorls crenulated at the keel. 9. *C. extenuatus.*

Body-whorl smooth or obsoletely lirate; anterior whorls nodulose at the keel. 10. *C. Hamiltonensis.*

Pullus subcylindrical, obtuse. 11. *C. Murravianus.*

Spire elongate ; outer lip broadly sinuous, anal sinus deep and oblique (Conorbis). 12. *C. atractoides.*

SPECIES EXCLUDED AND SYNONYMIC.

C. Traillii, Hutton. The published occurrences of this species in Australia refer to *C. Murravianus* and *C. ligatus.*

C. papillosus, Tate (ms.). The name being preoccupied *cuspidatus* is herein substituted.

C. scalaris, Tate (ms.). The name being preoccupied *ligatus* is herein substituted.

1. Conus cuspidatus, *spec. nov.*

Shell conoidal, about twice as long as wide, with a flat or very low spire ; spirally fine-ribbed on the spire and at the base, otherwise usually smooth.

Spire consisting of seven whorls separated by a well-defined, impressed, linear suture with rudely crenate margins ; ornamented spirally by flatly-rounded unequally-sized threads (usually about nine on the penultimate whorl), varying somewhat in thickness, but usually as wide as the interstitial furrows, crossed by incurved growth-lines.

The spire terminates in a slender, pyramidal, acutely-pointed pullus consisting of five smooth moderately convex whorls of slow increase.

Body-whorl obtusely angled at the periphery, regularly tapering to about three-fourths of its height where it is slightly constricted ; ornamented with sigmoid striæ of growth, and in the anterior-fourth by wrinkled threads, narrower than the interspaces. Some young shells have punctated impressed lines on the body-whorl.

Dimensions.—Total length, 58 ; greatest diameter, 30 ; length of aperture, 56 ; length and breadth of pullus, 2.

Localities.—Rather common in the lower beds at Muddy Creek, and in the blue clays at Schnapper Point. Calciferous sandstones of the River Murray Cliffs near Morgan.

2. Conus ptychodermis, *spec. nov.*

Shell narrow, conoidal, a little more than twice as long as wide ; spire very low, ending in a small obtuse pullus of two smooth whorls.

Spire consisting of four and a-half narrow flat whorls separated by a narrow channelled suture ; ornamented spirally by a medial, more or less prominent, thread, with or without a few threadlets, crossed by arched prominent growth-ridges and by coincident striæ.

Body-whorl obtusely angled at the periphery, regularly tapering to the front ; ornamented by inconspicuous spiral threads, which are wrinkled by the intercrossing of growth-folds, between which the surface is slightly contused.

Dimensions.—Length, 30 ; greatest width, 13 ; height of aperture, 28.

Locality.—Eocene beds at Muddy Creek.

3. Conus complicatus, *spec. nov.*

Shell varying from broadish- to narrow-conical, about twice as long as wide, spire very short, ending in a small obtuse pullus of two smooth whorls, the tip centrally immersed.

Spire-whorls four, narrow, the periphery slightly exsert, behind which they are slightly concave ; ornamented by three or four broad depressed liræ, tessellated by regular, deeply arched, growth-ridges.

Body-whorl sharply angled and slightly elevated at the periphery, regularly tapering to the front ; sculptured by somewhat regularly-disposed linear sulci ; separated by broad depressed ridges of which the first and fourth are usually broader, more elevated, and covered with flat granulations which range more or less in lines coincident with the striæ of growth.

Growth lines prominent, moderately ecurved, which produce slight crenatures in the spiral furrows. Outer lip slightly ecurved medially, deeply arcuately notched behind the peripheral angulation.

Dimensions.—Length, 18·5 ; greatest width, 10 ; length of aperture, 16·5 ; of another specimen, they are respectively 21, 10, 18.

Localities.—Eocene beds at Muddy Creek and Schnapper Point.

4. Conus pullulescens, *T. Woods.*

Reference.—Proc. Linnean Soc., New South Wales, vol. IV., p. 3, pl. i., fig. 4 (non. 3), 1880.

The author of the species-name included two different species under it, but both examples represent very young, almost unrecognisable, shells ; however in respect of one (fig. 4), I have been able to trace it up to a shell of moderate size (herewith figured), to which the specific designation is very applicable.

The species is conspicuous by its large turbinated pullus of three smooth tumid whorls.

The spire is either flat or very shortly elevated, its whorls narrow, separated by a linear suture ; ornamented with four or five spiral threads and rather slender, close, arched growth-lines.

The body-whorl is sharply angled, and is ornamented with flat spiral threads, becoming more or less obsolete with age (except at the front).

Dimensions.—Length, 32 ; greatest width, 15 ; length of aperture, 27 ; diameter of pullus, 3·5.

Localities.—Eocene beds at Muddy Creek, Schnapper Point, and River Murray Cliffs.

5. Conus ligatus, *spec. nov.*

Shell biconic ; spire of variable height, but usually moderately low, consisting of about seven gradated whorls, ending in a small naticiform pullus of one and a-half smooth whorls ; body-whorl more or less subpyriform.

Spire-whorls with an obtuse thick shoulder, the two slopes inclined approximately at a right angle and of about equal width ; the posterior area is usually flat or slightly concave, rarely with a slight upward inclination ; it is ornamented with four or five spiral threads, separated by narrower furrows, and rather close-set striæ of growth, conformable with the anal insinuation of the outer lip ; the anterior area is provided with one or two threadlets margining the rib-like keel.

Body-whorl varying from pyriform to elongate-ovate, the peripheral keel defined anteriorly by a linear constriction, posterior to which there are one or two threads on the peripheral band. The surface is sculptured at the posterior part with incised linear lines, which towards the front become wider, and are finally replaced by ribs narrower than the shallow interspaces ; the whole is crossed by growth-lines, which produce punctations in the linear sulci, and a fenestrated ornament anteriorly. The strength of the encircling lines is variable, and may be obsolete in the posterior half of the body-whorl.

The aperture is narrow, with a short anal sinus corresponding

with the posterior slope of the whorl ; the outer lip is conspicuously ecurved medially.

Dimensions.—Of a large typical example. Length, 41 ; greatest width, 22 ; length of aperture, 34 ; length of last whorl, 35. Of a pyriform variety, the corresponding measures are—32, 20, 27·5, 28·5.

Localities.—Eocene beds at Muddy Creek and Schnapper Point.

Affinity.—This species exhibits much individual variation in shape of body-whorl and length of spire, but presents in the cord-like appearance of its peripheral keel a character which readily distinguishes it from other Australian species.

A figured variety so closely resembles *C. deperditus* of the Hampshire and Paris basins, that it is only by comparison of actual specimens possible to separate them. Though in this individual the gradation of the spire and the peripheral rib have lost much of their prominence, yet the defining threads on the keel are present—a character absent in *C. deperditus ;* moreover, the latter is further distinguished by having two spiral and distant threads on the posterior area of the whorls. At the same time, the Australian similitude is no more than an extreme variation from a type which is obviously distinct from *C. deperditus.* However, it may be well to note that our Australian Cones are very difficult of specific definition, so much so that it is possible to bring all the species into very close relationship, through extreme individual variability.

6. Conus heterospira, *spec. nov.*

Shell acutely oval, biconic, with the anterior whorls of the spire gradated, the posterior ones more or less flatly depressed, rarely with a regular gradated spire throughout. The pullus arises abruptly from the spire as a small, smooth, shining papilla of one and a-half naticiform whorls.

Spire-whorls five ; the penultimate one medially angulated, its anterior slope perpendicular, the posterior slope slightly inclined, but with a faint medial depression ; on the ante-penultimate, the keel is close to the anterior suture, thence to the pullus the whorls are flat with a slight backward inclination whilst the keel appears as a slight rim.

The body-whorl is elongated and tapers to the front ; the peripheral keel is sharp ; the posterior slope, as also that of the spire whorls, is ornamented with prominent, much-arched, growth-lines, crossed by a few, usually obscure, spiral threads ; the rest of the body-whorl is ornamented with close-set, equidistant, incised lines, punctatedly impressed by the faint growth-lines.

Aperture narrow; outer lip ecurved medially and somewhat deeply arcuately sinuated at the posterior angle.

Dimensions.—Length, 34; greatest width, 16; length of aperture, 28; of body-whorl, 30.

Localities.—Blue clays at Schnapper Point, not uncommon; calciferous sandstones, Bird Rock Bluff, near Spring Creek.

Affinities.—This species has much resemblance to *C. ligatus*, but it is more elongate and has not the rim-like keel of that species. A characteristic feature is the abrupt gradation of the anterior whorls in the adult; in adolescent specimens the regular sloping low spire make it difficult at first sight to attach them to the adult; at this stage it resembles *C. complicatus*, but differs by its ornamentation, and the young of *C. cuspidatus*, from which it differs by its obtuse pullus and by the strongly arched growth-lines on the slightly concave spire-whorls.

The elate variety closely resembles *C. Huttoni*, mihi (*C. Traillii*, Hutton, *non* Adams), of the Pareora formation, New Zealand, which has a much narrower outline, more elongated spire, and a more inclined posterior slope of the whorls.

7. Conus Ralphii, *Tenison-Woods.*

Reference.—Proc. Lin. Soc., N.S.W., vol. III., p. 228, t. 20, fig. 4 (1878).

Shell pyriformly oval, with a moderately elevated broadly conical spire, ending in a small naticiform pullus of one and a-half smooth whorls.

Spire-whorls seven, plane or flatly convex, separated by a slightly channelled suture, which is crenulated, or even nodulated, at the posterior margin of the earlier whorls; ornamented on the posterior-half of each whorl with usually three conspicuous equidistant incised spiral lines.

Body-whorl bluntly rounded, rarely subangulated, at the periphery; ornamented on the posterior slope with a few incised lines, the rest of the surface varying from smooth to faint spirally-linear-grooved, punctatedly impressed; the base is usually spirally wrinkled, but sometimes inconspicuously so.

Aperture narrow, obliquely incurved at the posterior angle; outer lip slightly ecurved medially.

Dimensions.—Length 40; greatest width, 21; length of aperture, 34; height of body-whorl, 35.

Localities.—Very common at Muddy Creek; rare in the calciferous sandstones of the River Murray Cliffs, near Morgan.

The species varies slightly in the height of the spire and in the proportion of the width to the length, also the spire-whorls may show a slight convexity and even a perceptible angulation at the posterior margin of the suture; rarely does the nodose crenulation

continue beyond the fourth whorl. *C. Ralphii* was founded on a very young individual, 10 mm. in length, at which stage of growth there are only four spire-whorls, but from an authentic specimen of that size I have traced it, through many intermediate stages, to the adult example which is here figured. The comparisons made by the original describer with certain species of the Viennese Miocene and with *C. Carmeli* of Australian waters are now no longer applicable, as the coronation of the whorls of our fossil is a character restricted to juvenile examples.

8. Conus acrotholoides, *spec. nov.*

Shell pyriformly oval, with a low, broadly conical, almost hemispheric spire, ending in a small, obtuse, apiculate pullus of two smooth whorls, the first of which is vertical and its tip immersed.

Spire-whorls four, suture more or less concealed by the overlapping of the posterior edge of the whorls; ornamented by four rounded threads, about as wide as the intervening furrows, and by fine curvilinear transverse striæ, the posterior suture is margined by a broader flat band.

Body-whorl bluntly rounded at the periphery, on which are three spiral threads; anterior to the periphery there are about 14 flat granulose threads, defined by linear lines, the flat interspaces are more or less spirally striated; the granulose liræ become crowded towards the front; the whole surface is marked with fine close-set striæ of growth.

The outer lip is post-medially ecurved, and obliquely and shortly notched at the posterior angle.

Dimensions.—Length, 14; greatest width, 7; length of aperture, 11·5.

Locality.—Blue clays at Schnapper Point.

9. Conus extenuatus, *spec. nov.*

Shell narrowly biconical, two and a-half times as long as wide; the spire subscalar, gradually tapering to the small obtuse pullus of two whorls, the first of which is oblique, with its tip immersed.

Spire-whorls seven, with the periphery slightly exsert, behind which they are slightly concave, separated by a narrow well-defined suture. The earlier whorls are slightly nodulose or crenulate at the keel, but this ornament disappears with the revolution of the spire. The spiral ornamentation consists of three or four unequal flat threads, which is crossed by close-set arched striæ.

Body-whorl bluntly keeled at the periphery, concave behind, slightly contracted in the anterior-third, but otherwise much attenuated towards the front. The surface with distant, regular, punctated, spiral grooves, between which are wider flat ridges.

Outer lip moderately ecurved medially ; the anal notch is broad and shallow.

Dimensions.—Length, 60 ; greatest width, 24 ; length of aperture, 50.

Localities.—Muddy Creek ; River Murray Cliffs ; Spring Creek, near Geelong ; Cheltenham (doubtful identifications).

10. Conus Hamiltonensis, *spec. nov.*

Similar to *C. extenuatus*, and perhaps only a variety, though not yet connected by intermediate forms ; it differs by being proportionately broader, by the absence of nodulations and a keel on the earlier whorls, and by the more numerous spiral threads (about eleven) upon the spire-whorls.

The penultimate and body-whorl are obtusely keeled and nodulate. The median area of the body-whorl is smooth or obsoletely spiral-lirate, not sulcate.

Dimensions.—Length, 32·5 ; greatest breadth, 14 ; length of aperture, 25.

Locality.—Lower beds at Muddy Creek.

11. Conus Murravianus, *spec. nov.*

Shell narrowly biconical, more than twice as long as wide ; spire scalar, gradually tapering to the cylindroid pullus of three and a-half smooth convex whorls.

Spire-whorls six, suture concealed by reflection of their posterior margin, bluntly angled a little in front of the middle, the longer backward-sloping area slightly concave; ornamented with close-set sigmoid striæ and obsolete spiral threads. The posterior-half of the first whorl is slightly costated.

Body-whorl broadly lanceolate in outline and narrowly truncate at the front, roundly angular at the periphery with a concave shoulder, which is obsoletely lirate ; whole surface marked with fine sigmoidal growth-lines, and at the front by encircling ridges.

Outer lip with a shallow, obliquely-cut, notch at the posterior angle, thence with a gentle outward curve to the middle, and more rapidly declining to the front.

Dimensions.—Length, 61 ; greatest width, 26 ; length of aperture, 46.

Locality.—Calciferous sandstones of the River Murray Cliffs near Morgan.

This species comes near to *C. gradatulus*, Sow., and differs so far as one can judge by the figure, by the ante-medial position of the blunter keel on the spire-whorls.

12. Conus (Conorbis) atractoides, *spec. nov.*

Shell ovately fusiform, biconic ; test moderately thick ; surface spirally furrowed, smooth and shining. Spire regularly conical,

about one-third the total length of the shell, consisting of five whorls, ending in a small, blunt, turbinate pullus of two and a-half smooth rounded whorls.

Spire-whorls slightly convex, separated by a well-defined linear suture ; ornamented by six flat spiral ribs, the three posterior ones separated by flat shallow sulci of about equal width, the three anterior ones by linear grooves sometimes almost obsolete ; the interstitial furrows are punctulatedly impressed.

Body-whorl obtusely angled at the periphery, regularly attenuated anteriorly ; ornamented with flat spiral ribs (about 30), separated by narrow furrows, crossed by sigmoidal lines of growth which produce the appearance of punctations in the interstitial furrows.

Aperture narrow, broadly emarginate in front ; outer lip thin and sharp on the edge, smooth within, much ecurved medially.

Dimensions.—Length, 16·5 ; greatest width, 6·5 ; length of aperture, 10.

Locality.—Clayey greensands, Adelaide-bore.

Compared with actual specimens of *C. dormitor*, from the Eocene of Hampshire, it has a narrower outline and a longer spire, but especially differs by the ornamentation which consists of engraved, punctated, spiral lines, and not of raised threads with elegantly tessellated interspaces.

By its sulcate sculpture and greatly arched outer lip it is more allied with *C. alatus*, F. Edwards, of the Hampshire basin ; but it seems to differ by its blunt-pointed apex and rounded shoulder to the whorls, whilst the proportional measurements indicate a narrower shell with a shorter aperture.

FAMILY CYPRÆIDÆ.

Genus Cypræa.

I have not been successful in arranging the species in conformity with the sectional subdivision of the genus as employed by recent conchologists. Those sections are largely based on external shape, and as some of our fossil species show extensive enough variability as to necessitate the inclusion of the same species in two sections, I have been induced to group them in respect to themselves. Some of them are wholly unprovided for in the scheme of recent species, such as *C. gastroplax* with its wing-like base ; and the group typefied by *C. eximia*, which though having a near ally in *C. umbilicata* of the same geographic region, yet markedly differs by the dental-sulcations of, and widely extending upon, the inner lip, though in one individual-specimen, through extreme age, the normal dentition is acquired.

SYNOPSIS OF SPECIES.

I. Base rounded.

1. Aperture notched or extending into a short canal behind.
   - Shell cylindroid; teeth small, numerous. 1. *C. parallela.*
   - Shell oval-oblong; teeth large.
     - Back elevated; spire concealed. 2. *C. scalena.*
     - Back depressed; spire prominent. 3. *C. subsidna.*
   - Shell elongate-oval; surface contused. 4. *C. ampullacea.*
   - Shell oval-subpyriform.
     - Spire slightly exsert; tumid; posterior canal distinct. 5. *C. Archeri.*
     - Spire nearly concealed; less tumid; posterior canal very short. 6. *C. Jonesiana.*
   - Shell globose; spire exsert; surface contused. 7. *C. contusa.*
2. Aperture roundly produced behind on left side, not distinctly notched posteriorly.
   - Shell cylindroid, spire exsert. 8. *C. subpyrulata.*
   - Shell cylindroid-subpyriform; spire umbilicated. 9. *C. brachypyga.*
   - Shell oval-subpyriform.
     - Spire concealed, umbilicated; outer lip much arched behind. 10. *C. pyrulata.*
   - Shell pyriform.
     - Spire concealed, slightly impressed; shell under one inch long. 11. *C. Murraviana.*
     - Spire exposed, deeply umbilicated; shell two inches or so long. 12. *C. leptorhyncha.*
   - Shell globose; spire convex. 13. *C. ovulatella.*

II. Base flat, not winged.

1. Inner lip strongly dentate-sulcate.
   - Anterior canal much produced, attenuated.
     - Beak straight or nearly so.
       - Shell oval-pyriform; beak with two dorsal tubercles. 14. *C. eximia.*
       - Shell globose-pyriform; beak with or without basal tubercles. 15. *C. sphærodoma.*
     - Beak much upturned, without basal tubercles.
       - Shell oval-oblong, very gibbous. 16. *C. toxorhyncha.*
   - Anterior canal short, obtuse, without basal tubercles.
     - Shell oblong-subpyriform; posterior canal subtruncate with a very wide base. 17. *C. platypyga.*
     - Shell more oval; posterior canal narrow, short. 18. *C. consobrina.*

2. Inner lip tuberculate or tooth-ridged, not dentate-sulcate (also *C. sphærodoma*, pars), or edentulous.
Anterior canal much produced, depressed.
Shell pyriform ; aperture almost edentulous.
19. *C. platyrhyncha*
Anterior canal short.
Shell broadly oval, with a low convex back ; anterior canal straight ; both lips dentate throughout.
20. *C. amygdalina.*
Shell oval, very large, back very gibbous, anterior canal upturned ; aperture almost edentulous.
21. *C. gigas.*
Shell spheroidal, very large. 22. *C. dorsata.*

III. Base flat, dilated into a horizontal circular disk.
Shell oval, very gibbous. 23. *C. gastroplax-*

EXCLUDED SPECIES.

C. oviformis, Sow., is attributed to Tenison-Woods as author, and to South Australia for habitat, by Johnston in Geol. Tasmania, 1888; but Tenison-Woods refers (Geo. Obs. in S. Aust., p. 83, 1862) to this species as a London Clay fossil, and not as occurring in South Australia.

1. Cypræa parallela, *spec. nov.*

Shell cylindrical, twice as long as wide; the spire exsert, around which the body-whorl is flatly rounded ; the longitudinal curvature of the back is interrupted at intervals, which gives rise to the appearance of spiral threads, usually conspicuous towards the two ends, but is sometimes obsolete.

The aperture is shortly produced into a bluntly-pointed canal at the ends, narrowed at the front. The outer lip is margined at the two extremities, leaving a median unmargined portion of variable length ; the teeth are small and numerous (about thirty). The inner lip is thickened, and slightly projecting posteriorly ; there are about twenty teeth in its whole length ; the columella projects internally towards the front as a broad, concave, ridged plate.

Dimensions.—Length, 18 ; width, 9 ; height, 8.

Locality.—Eocene; Muddy Creek.

This species resembles dwarfed examples of *C. Isabella*, Linn., of the Indo-Australian region, but has an exsert spire, and is slightly more narrowed at the front.

2. Cypræa scalena, *spec. nov.*

Shell oval-oblong, somewhat gibbous, highest near the middle, with a steep slope anteriorly and rather abruptly narrowed at

the front, subtruncated at both ends; left side swollen; spire incompletely concealed, slightly exsert.

Aperture narrow, margined with elongate teeth; outer lip slightly margined at the two extremities, shortly projecting beyond the spire; inner lip thickened posteriorly and confluent with the outer lip, forming a very short canal; front part of columella much elevated internally, concave and ribbed.

Surface of the shell smooth or marked with faint distant spiral lines and obscure contusions.

Dimensions.—Length, 37; width, 24; height, 21.

Locality.—Eocene; Muddy Creek.

This fossil comes very near to *C. Reevei*, Gray, recent in S.W. Australia, but is proportionately higher and consequently the slopes from the highest point are more rapid, the front is more narrowed, whilst the swollen left-side gives it a distinctive lop-sided profile. The corresponding measures of *C. Reevei* are 37, 22, and 19.

3. Cypræa subsidua, *spec. nov.*

Shell oval- inclined to trapezoidal- oblong, depressedly convex, obtuse at both ends; the right side flatly rounded, the left more arched and rather abruptly contracted to the front; spire exsert.

Aperture narrow, base rather flat; outer lip not margined, broadly subplanulate medially, with about twenty-five stout rounded ridges. Inner lip developed behind into a prominent protuberance margining the short anal canal and posterior part of the aperture, with about twenty acute ridges; it is somewhat flattened towards the front, and runs out into a narrow triangular extension of the base, supporting the very short, truncate, anterior canal. The columella is much elevated internally and very concave.

The surface of the shell is smooth.

Dimensions of a large example.—Length, 26; width, 17·5; height, 14. Of a small example, 18, 11·5, and 9.

Locality.—Eocene; Muddy Creek.

The squat-form, flattish base and post-ventral protuberance distinguish this species from *C. scalena*, which from its undeveloped appearance might be regarded as an inmature state of that species. But the numerous examples under observation prove that the adolescent feature is proper to the adult as it is in the living *C. Reevei* and its fossil analogue *C. scalena*. Without comparison of actual specimens, I am not sure if this be distinct from *C. Bartonensis*, F. Edw., of the English Eocene, though the Australian shell appears different, by its large posterior boss and the less prominent spire.

4. Cypræa ampullacea, *spec. nov.*

Shell elliptic-oval, highest and widest a little behind the middle; obtusely rounded apically with a very narrow, flat, exposed spire; gradually narrowed to the front; surface transversely and spirally lineate, the small rectangular interspaces contusedly impressed.

Aperture moderately wide; slightly curved and obsoletely notched posteriorly; extended into a short straight beak, which is somewhat effusively expanded at the tip. Outer lip not margined, distantly toothed (about thirty), making a very acute angle at its junction with the inner lip. Inner lip with a short, slight ridge-like thickening at the posterior end, provided throughout with long tooth-ridges (about twenty-five).

Dimensions.—Length, 34; width, 19; height, 18.

Locality.—Eocene blue-clay at Schnapper Point; one example, apparently not quite mature, as the posterior canal and the lips are incompletely developed.

5. Cypræa Archeri, *Tenison-Woods.*

Reference.—Proc. Roy. Soc., Tasmania, tab. 1, figs., 9-9*a*, p. 22 (1876).

Shell oval-subpyriform, moderately inflated. Shortly narrowed and truncated at each end; spire exsert; surface smooth or spirally lineate.

Outer lip margined externally, thickly inflected, very slightly produced behind, with about 20 rounded dental ridges; inner lip having a short elevated callosity confluent with the outer lip intervening between which is a slight anal notch; the inner lip has about 15 subacute dental ridges.

Dimensions.—The species varies a little in shape, particularly as to the proportionate length. I give the measures of a short and long example. (1) Length, 20; width, 13; greatest height, 11, at 9 mm. from the posterior end. (2) Length, 27; width, 15·5; height, 14.

Locality.—Table Cape, Tasmania! *(R. M. Johnston).*

I cannot attach any of our Continental cowries to this species, though it has a distant resemblance to *C. pyrulata* and *C. Murraviana*. Its inclusion in the published lists of River Murray and Muddy Creek fossils is now withdrawn.

6. Cypræa Jonesiana, *spec. nov.*

This is comparable with *C. Archeri*; from the short variety of which it differs by being less tumid and proportionately narrower, from both varieties it differs by its gentle front slope similar to *C. pyrulata*, but it has not the produced posterior emargination of that species.

The spire is more or less concealed. The outer lip is broadly reflected, prominently margined, and is furnished with 20 prominent teeth; the inner lip has 18 narrow elongate teeth.

Dimensions.—Length, 17·5; width, 11; greatest height, 9, at 7 mm. from the posterior end.

Localities.—Miocene; Muddy Creek. Older Pliocene; Dry Creek-bore, near Adelaide.

The species-name is a public acknowledgment of the valuable aid rendered to geologic science in South Australia, more particularly in reference to Tertiary Geology, by Mr. W. J. Jones, Conservator for Water.

7. Cypræa contusa, *McCoy.*

Reference.—*C. (Luponia) contusa*, Pal. Vict., Decade V., tab. 49, figs. 3-3*c*, 4-4*a* (1877).

Shell globular; spire slightly projecting, consisting of three slightly convex whorls, the apex obtuse and prominent; anterior canal very short. Surface irregularly reticulated with small contusions or irregular polygonal bruise-like depressions.

Dimensions.—Length, 30; proportional width, $\frac{75}{100}$; height, $\frac{70}{100}$.

Localities.—Eocene. Muddy Creek!; Schnapper Point!; *(McCoy);* River Murray Cliffs, rather common, but usually dwarfed!

8. Cypræa subpyrulata, *spec. nov.*

Shell cylindroid or narrowly oval-oblong; spire exposed, the rounded periphery of the penultimate whorl exsert and constricted above and below; the body-whorl arises abruptly from the suture with a well-rounded curve to the highest point of the low back, which is a little behind the middle; surface smooth.

Aperture rather wide, shortly loop-like behind, without a distinct posterior canal, anteriorly produced into a short straight beak with effuse lips. Outer lip margined, inconspicuously reflected, denticulated (about 25), slightly roundly-extending beyond the spire. Inner lip with a slight ridge-like thickening at the anal insinuation and confluent with outer lip, there are about 20 long narrow tooth-ridges.

Dimensions.—Length, 25·5; width, 13; height, 11.

Locality.—Eocene; Muddy Creek (common).

This species is somewhat intermediate in outline between *C. parallela* and *C. pyrulata*; from the former it differs by its outer lip more arched and projecting behind, by its less abrupt front-truncation, and its short anterior canal; from the latter by its cylindroid outline.

9. Cypræa brachypyga, *spec. nov.*

Allied to *C. subpyrulata*, but is much attenuated to the front

and always small ; the spire is exserted. In shape it varies from ellipsoid-cylindrical to cylindroid-subpyriform. The outer lip is narrowly reflected, distinctly margined, emarginate but not canaliculate behind, and provided with about 20 transverse teeth ; the inner lip has about 15 teeth.

Dimensions.—Length, 15·5 ; width, 8 ; height, 7 (at 5·5 mm. from the posterior end).

Localities.—Eocene ; Muddy Creek and Schnapper Point.

10. Cypræa pyrulata, *spec. nov.*

Shell cylindroid-pyriform, inflated posteriorly and gradually tapering to the front ; spire more or less concealed, narrowly but deeply umbilicated, from the edge of which the whorl arises abruptly with a well-rounded curve to the highest point of the back, which is at about two-fifths the total length from the posterior end. Surface smooth or spirally lineate.

Aperture rather wide, emarginate but not canaliculate behind, extending at the front into a short straight truncated beak. Outer lip narrowly inflected, not distinctly margined, transversely ridged (about 25), much-curved behind and projecting beyond the spire. Inner lip hardly thickened and not at all produced posteriorly, with about 20 dentate ridges.

Dimensions of two examples.—Length, 27 and 24 ; width, 16 and 13·5 ; height, 13·5 and 11·5.

Locality.—Eocene ; Muddy Creek (very common).

11. Cypræa Murraviana. *spec. nov.*

Shell pyriform, back ventricose, abruptly rounded to the concealed faintly-depressed spire, tapering rapidly but not so abruptly to a straight, broadish, very short, truncated beak, which is rounded on the margins.

Aperture narrow, gently curved posteriorly, the outer lip projecting backwards into a short lobe with a thickened quadrate margin : there is no anal canal. Outer lip broadly inflected, externally margined, with about 20 narrow tooth-ridges ; inner lip convexly rounded, with from 12 to 15 long slender ridges ; columella-plate narrow, ridged, anteriorly running out in an oblique tooth-like ridge to the extremity of the beak.

Dimensions.—Length, 20 ; width, 14 ; height, 11·5 (at 8·75mm. from the posterior end).

Localities. — Eocene. River Murray Cliffs ! ; near Mount Arapiles, Victoria *(J. Dennant)*.

This fossil cowry resembles *C. pyrulata* by its protuberant arched outer lip and the absence of a posterior canal, but differs by being more ventricose in the dorsal profile, more abruptly narrowed at front and by the much incrassated outer lip. From

C. Archeri it differs in its globosely pyriform shape and the greater posterior curvature of the aperture. Among extra-limital species it makes a near approach, judging by illustrations, to *C. inflata*, Lamarck, of the English and Parisian Eocene, but is more abruptly attenuate to the front, and the aperture not so gradually arched behind.

12. Cypræa leptorhyncha, *McCoy.*

Reference.—*C. (Luponia) leptorhyncha*, Pal. Vict., Decade V., tab. 49, fig. 1—1c. (1877).

Pyriform, ventricose; spire exposed, deeply depressed; outer lip much arched and protuberant posteriorly, no distinct anal canal; anterior canal straight, short, narrowed and subtruncate at the front.

Dimensions.—Length, 58; width, 36; height, 31.

Localities.—Eocene. Muddy Creek!; River Murray Cliffs!; Schnapper Point! (*McCoy*); Cheltenham!

The author of the species compares it with *C. inflata* and *C. globularis*, of the European Eocene, and with *C. Haveri* and *C. Genei*, Michelotti, of the Italian Miocene; but distinguishes it by the greatly inarched posterior end of the outer lip as well as the different form of the anterior beak.

13. Cypræa ovulatella, *spec. nov.*

Shell globose, abruptly descending to the broad flatly-convex spire, less abruptly descending to the short truncate anterior canal, which is bevelled on the inner margin and somewhat effusively reflected.

Aperture roundly-narrowed posteriorly, thence widening to the base of the anterior canal, which is almost closed by the approximation of the large basal plications of each lip.

Outer lip narrowly-reflected, flat, but with a sharply rounded exterior margin, furnished on the inner edge with from eight to ten strong tooth-ridges, the anterior one of which is oblique, and margins the left side of the canal. Inner lip with ten to eleven small transverse ridges; the columella-plate is high, abruptly ascending from the inner lip, bluntly crenate on the edge; columella with a strong fold, which runs out to the front of the anterior canal.

Dimensions.—Length, 11; width, 8·5; height, 7 (at 4·5 mm. from the posterior end).

Localities.—Eocene; Aldinga Cliffs and Adelaide-bore.

This species has a general resemblance to the recent *Trivia ovulata*, Lamarck, but the produced anterior canal separates it generically.

14. Cypræa eximia, *G. B. Sowerby.*

References.—Sow. in Strzelecki's "New South Wales," p. 296, tab. 19, figs 1—3 (1845). *C. (Aricia) eximia* (Sow.), McCoy, Pal. Vict., Dec. III., tabs. 28, 29, figs. 2—2b (1876).

Pyriform, ventricose posteriorly, beaked at both ends, abruptly and obtusely subtruncate over the flat almost-concealed spire, tapering gradually into a long convex straight beak, which is supported on each side by a narrow triangular, straight and sharp-edged, plate-like extension of the base. At the base of the beak on each side of its upper aspect is an oblong rounded tubercle. The posterior canal is shorter than the anterior one, supported by a flange-like extension of the base, slightly upturned and bent to the left; its right side is broader, and carries an oblong tubercle. Outer lip inflected, strongly toothed on the inner margin; inner lip with narrow deep sulci, with broad intervening flat ridges. Columella without an internal plate-like extension.

Dimensions.—Length varying from about 100 to 65 mm.; the proportional width, $\frac{50}{100}$; height, $\frac{30}{100}$; length of snout, $\frac{22}{100}$; of anal canal, $\frac{80}{100}$, but variable.

Localities.—Eocene. Muddy Creek!; Schnapper Point!; Fyansford, and three miles west of Gellibrand River (*McCoy*). Well-sinking at Franklin, near Launceston (*Strzelecki*), at a depth of 140 feet; Table Cape (*Hobart Mus.*).

This species is the type of a section not represented in living creation, though having a general resemblance to *C. umbilicata*, Sow., constituting Josseaume's Section *Umbilia*, which may be characterised by the dentate-sulcated inner lip, not denticulate-ridged, as pointed out by G. B. Sowerby in his description of it. Sowerby's comparison was with *C. Scottii*, *C. umbilicata* being at that time yet unknown.

Both Sowerby's and McCoy's figures show the anal canal bent to the right, whereas all of several specimens which I have had under examination have it twisted in the opposite direction.

15. Cypræa sphærodoma, *spec. nov.*

A near alliance of *C. eximia*, but differs by its globose body-whorl, also by the abrupt sinistral curvature of the posterior-third of the aperture and the strong torsion of the posterior canal In other particulars there is a close agreement.

Dimensions.—Total length, 84; length, excluding canals, 46; width, 48; height, 40.

The proportional measures of these two closely-related species are—

	Length (excl. canals).	Width.	Height.
C. eximia ...	100	82	70
C. sphærodoma ...	100	104	87

Localities.—Eocene. River Murray Cliffs, near Morgan! ; Muddy Creek! (*J. Dennant*).

Var. ? The example from Muddy Creek is of the length of about five and a-quarter inches and has the inflated back of the type, but otherwise it presents differential characters, which might from an extreme point of view be regarded as of sectional value, though I am inclined to consider them as the result of individual variation of an extreme senile growth.

The anterior canal is longer and slightly curved upwards, but the basal flanges are broad and acutely rounded on the edge ; there are no basal tubercles. The posterior canal is the same, except that the basal flanges are flatly, broadly, and thinly expanded. But the chief differences belong to the aperture ; on the columella-side the base is broad and flatly-rounded to the inner margin, which carries about thirty short, convex, dental ridges, about equal in width to the interspaces ; the outer lip, instead of being convexedly inflected, is flat or slightly concavedly-declinous from the exterior to the inner margin, on the latter of which there are about thirty sharply-rounded narrow dental ridges becoming effaced at from one-half to one-third the width from the inner margin. Thus the chief exceptional characters are the short teeth and flat inner lip, replacing the dental-sulcations on a steeply-inclined area, in which regard this variety makes a connecting link between *C. eximia* and *C. umbilicata.*

Dimensions.—Length, 135 ; width, 75 ; height, 55 ; length of anterior canal, 35 ; of posterior canal, 25.

16. Cypræa toxorhyncha, *spec. nov.*

Resembles *C. eximia*, but differs by its high steep-sided back and bent canals.

The back is very ventricose, abruptly rounded to the flat almost-concealed spire, abruptly tapering to the anterior canal ; the left side is very steep, but the right is less abrupt. The posterior canal, viewed from above, is very broad at the base, with thick rounded margins, the beaked-portion is broadly convex, not upturned though slightly bent ; its margins are much thickened, the inner side extends beyond the other ; there is no basal tubercle. The anterior canal is supported by a thick round-edged extension of the base, and has no basal tubercles ; the canal is cylindroid, almost closed, much upturned and slightly bent to the left.

Dimensions.—Total length, 94 ; length from spire to base of anterior canal, 55 ; width, 47 ; height, 43. The relative proportions to the length of the shell, exclusive of the canals, of the two species are as follows :—

C. eximia—Length, 100 ; width, 82 ; height, 70.

C. toxorhyncha—Length, 100 ; width, 85 ; height, 78.

Though these proportionals indicate a wider and higher shell for *C. toxorhyncha*, yet they fail to express the striking differences in the profiles of the two species.

Locality.—Eocene ; Muddy Creek *(J. Dennant)*.

17. Cypræa platypyga, *McCoy.*

Reference.—*C. (Aricia) platypyga*, Pal. Vict., Decade III., tab. 30, figs. 1—1c (1876).

This somewhat oblong-pyriform shell is remarkable for its short, extremely wide, subtruncate, posterior beak ; the right side of which is much wider than the more-pointed left side.

Dimensions.—Length, 75 ; width, 45 ; height, 39.

Localities.—Eocene. Schnapper Point ! *(McCoy)* ; Muddy Creek ! ; Table Cape *(R. M. Johnston)*.

18. Cypræa consobrina, *McCoy.*

Reference.—*C. (Aricia) consobrina*, Pal. Vict., Dec. V., tab. 49, figs. 2—2c (1877).

"Related to *C. platypyga*, but is more oval, much shorter canals and concealed spire. Length, 2 inches 8 lines ; width, $\frac{65}{100}$; height, $\frac{56}{100}$. Very rare at the Moorabool River."—*McCoy.*

Erroneously quoted as occurring in the River Murray Cliffs.

19. Cypræa platyrhyncha, *McCoy.*

Reference.—*C. (Aricia) platyrhyncha*, Pal. Vict., Dec. III., tab. 30, figs. 2—20 (1876).

Pyriform, gradually tapering to a broad, flat, elongate truncated beak ; posterior canal short and abruptly reflexed ; spire concealed ; anterior part of aperture with a few small obtuse teeth, the rest edentulous.

Dimensions.—Length, 100 ; width, 47 ; height, 43 ; length of anterior canal, 25.

Localities.—Eocene. Bird-Rock Bluff, Spring Creek (*McCoy*); Table Cape (*R. M. Johnston*).

20. Cypræa amygdalina, *spec. nov.*

Shell broadly oval, with a moderately low convex back, highest at about three-sevenths from the posterior end, thence flatly convex to the abrupt margin of the slightly-sunken concealed spire ; the anterior portion tapers gradually to the short, straight, broad, subtruncated canal. The posterior canal is short, though prominent, obtuse, slightly upturned, and bent to the left.

Aperture rather wide, the hinder part gently arched to the left. Outer lip flatly rounded, broadly inflected, with about twenty short rounded teeth on the inner margin, which are somewhat evanescent posteriorly. The base on the right side is very broad in the middle, concavely sloping at the aperture, which is fur-

nished in the anterior-half with about eight obtuse tubercles, sometimes shortly prolonged on to the base, and towards the posterior end with four or five elongated teeth, the rest of the inner lip obsoletely denticulate. The columella is rounded, not internally extending in the form of an erect plate.

Dimensions.—Length, 57 ; width, 36 ; height, 28.

Locality.—Well-sinking in the Murray Desert.

This species is not much unlike *C. Mappa*, but it has a different dorsal and transverse outline.

21. Cypræa gigas, *McCoy.*

References.—Ann. Mag. Nat. Hist., p. 438 (1867) ; *C. (Aricia) gigas*, Pal. Vict., Decade II., tab. 15, tab. 16, fig. 2, tabs. 17 and 18, fig. 1 (1875) ; Dec. III., tabs. 28 and 29, fig. 1 (1876).

Shell very large, oval, back very gibbous, roundly sloping at both ends ; anterior canal deep, narrow, elongate, projecting upwards ; posterior canal obliquely truncate, reflexed upwards, and adherent to the spire. Base flattened, oval, much thickened ; inner lip rounded, smooth within, flattened near the anterior canal ; outer lip inflected, tumid, broad, with nine or ten obsolete obtuse teeth near the anterior end and a few near the posterior end.

Dimensions.—Length, 8 inches ; proportional width, $\frac{67}{100}$; height, $\frac{55}{100}$.

Localities.—Muddy Creek, Schnapper Point, and near the mouth of the Gelibrand River *(McCoy)*. Casts probably of this species, River Murray Cliffs.

This is the largest known Cowry, living or fossil.

22. Cypræa dorsata, *spec. nov.*

Shell very large, sphæroidal ; abruptly rounded at both ends, inflatedly rounded at the sides ; spire concealed. Anterior canal deep, narrow, short, upturned, obliquely truncate ; posterior canal rather broad, deep, short, confluent with the spire. Base as in *C. gigas.*

Dimensions.—Length, 95 ; width, 75 ; height, 65.

Localities.—Eocene. Muddy Creek *(J. Dennant)* ; Schnapper Point *(R. T.)*.

This rival, in point of size, to *C. gigas* (as it attains to considerably larger dimensions than those of the type-specimen) is separable from it by its sphæroidal form and very short anterior canal ; it stands to that species in much the same way that *C. decipiens* does to *C. Thersites.*

23. Cypræa gastroplax, *McCoy.*

Reference.—*C. (Aricia) gastroplax*, Pal. Vict., Decade II., tab. 16, fig. 1 ; tabs. 17 and 18, fig. 2 ; 1875.

"The enormously extended circular thin flange into which the base is extended renders this cowry totally unlike any previously known living or fossil species. Length and width of body-whorl $2\frac{1}{2}$ and 2 inches; with disc length and width $4\frac{1}{4}$ inches. Spire small, blunt, of two volutions. Rather rare at Mornington, Hobson's Bay."—*McCoy*.

Genus Trivia.

SYNOPSIS OF SPECIES.

Shell cross-ribbed.
Shell globose, with linear dorsal furrow.
1. *T. avellanoides.*
Shell oblong, with large dorsal smooth area.
2. *T. erugata.*
Shell smooth, without cross-ribs, globose. 3. *T. pompholygota.*

1. Trivia avellanoides, *McCoy*.

1876. Cypræa (Trivia) avellanoides, *McCoy*, Pal. Vict., Decade III., tabs. 28, 29, figs. 3—3*c*.
1877. Trivia Europæa *(Montfort)*, *Tenison-Woods*, Proc. Roy. Soc., Tasmania, p. 91.
1879. Trivia minima, *Tenison-Woods*, Proc. Lin. Soc., N.S. Wales, vol. IV., p. 4, tab. 1, fig. 8.
1884. Trivia avellanoides *(McCoy)*, *Tate*, Proc. Roy. Soc., Tasm., p. 209; id., *Johnston*, p. 222.

Shell thin, oval-globose; surface ornamented with very narrow, sharply defined, thread-like ridges, which are usually interrupted by a narrow smooth space along the middle line of the back.

As pointed out by McCoy, it is much more globose and has much fewer and more distant cross-ribs than *T. australis*; but it is the counterpart of *T. avellana*, Sow., of the English Crags (hence its specific name), distinguishable especially by its uniformly shorter and more spheroidal form.

Tenison-Woods referred dwarfed examples of this species to *T. Europæa*, from which it is separable by much the same characters as it is from *T. australis*.

Tenison-Woods figures and describes an early stage of growth of this species as *T. minima*, relying for a differential character on the absence of a dorsal division between the ridges; he judged, moreover, the shell to be an adult because of the thickened lips, overlooking the fact that *Trivia*, unlike *Cypræa*, exhibits no shell-metamorphosis. An examination of many small examples of *T. avellanoides* permits me to state that the smooth dorsal area does not begin to develop until the shell has reached a length of about eight millimetres.

Dimensions.—Length of a large specimen, 31; the average

proportional width is $\frac{78}{100}$, height, $\frac{70}{100}$; but dwarfed examples of from 10 to 15 mm. are more common.

Localities.—This is one of the commonest and most widely diffused species of the Australian Eocene-beds. South Australia.—River Murray Cliffs; Turritella-clays, Aldinga-cliffs; bore at Adelaide. Victoria.—Schnapper Point !, Muddy Creek ! and Corio Bay ! *(McCoy)*; Spring Creek ! Tasmania.—Table Cape !; and Turritella-limestones, Flinders' Island *(Johnston)*.

2. Trivia erugata, *spec. nov.*

Shell thin, narrowly oblong, spire concealed. The back is broadest and highest near the posterior end, is depressedly convex in a longitudinal direction, abruptly sloping to the posterior end, but more gently to the front; the right side is rather steep, medially slightly depressed, the left side is more convex. In young shells the median constriction is very pronounced, and the spire is prominently exsert.

The aperture is narrow; the outer lip narrowly thickened and indistinctly margined, it is slightly incurved medially, rounded at the extremities, and ornamented with about 25 teeth.

The cross-ribs are evanescent at about half the length of the sides, being thus interrupted by a large oval smooth dorsal area.

Dimensions.—Length, 5·5; greatest width, 3; and height, 2·5.

Locality.—Lowermost horizon of the Muddy Creek-section.

T. erugata differs from known, recent and fossil, species by the combination of an oblong shape with a large smooth dorsal area.

3. Trivia pompholugota, *spec. nov.*

Shell globose, smooth and shining, abruptly descending to the excessively short anterior canal and to the slightly-projecting spire.

Aperture moderately wide, rounded behind. Outer lip slightly projecting behind, narrowly thickened and inflected, minutely wavy-wrinkled, margined externally, provided with sixteen stout elevated ridges; inner lip with a keel-like margin, which is tuberculate-dentate (eight tubercles in the anterior-half and sixteen in two rows in the posterior-half); the columella-plate is high, flatly-concave, smooth, and reaches to the front.

Dimensions.—Length, 7·5; width, 5·5; height, 5.

Locality.—Adelaide-bore.

The apertural characters, which, however, indicate a somewhat adolescent shell, are those rather of *Trivia* than *Cypræa*.

Genus Erato.

The affinities of this genus are considered by some conchologists to be with *Marginella*, but I revert to its location in the Family Cypræidæ.

SYNOPSIS OF SPECIES.

Back without a longitudinal furrow [ERATO, *sensu stricto*].
Columella spirally ridged at the front; aperture narrow.
Pyriform-oval; spire very short. 1. *E. minor.*
Fusiform-oval; spire elevated. 2. *E australis.*
Columella ending in a strong spiral plait; aperture moderately wide.
Pyriform-oval.
Outer lip squarely shouldered behind.
3. *E. pyrulata.*
Outer lip roundly sloping behind, more attenuated to the front. 4. *E. Morningtonensis.*
Cylindric-oblong. 5. *E. duplicata*
Back with a longitudinal sulcus [ERATOPSIS].
Columella tooth-ridged at the front; shell pyriform-oval.
6. *E. illota.*

SPECIES EXCLUDED.

E. ? octoplicata (*Woods*), *Tate*, is a true *Marginella* as originally placed.

1. Erato minor, *Tate.*

Reference.—Trans. Roy. Soc. S, Aust., vol. I., p. 96, 1878.

Shell minute, shining, triangularly pear-shaped, rather tumid, abruptly narrowed in front; spire short, obtusely pointed, the terminal whorls narrow and flat. Aperture narrow, straight, emarginate behind. Outer lip roundly inflected with about fifteen denticles, broadly and varicosely reflected on the body-whorl, callously spreading behind on the penultimate whorl; the varicose reflection is minutely granulate or pustulate. The outer lip is squarely curved behind, and ascends to about the middle of the penultimate whorl.

The columella has five crowded, slender, oblique ridges at the front, which are succeeded by denticles for the greater part of the rest of the lip.

Dimensions.—Length, 4; width, 2·5; height, 2·25 (at 1·25 from the posterior end).

Localities.—Eocene. Muddy Creek; River Murray Cliffs, near Morgan; probably Table Cape and Schnapper Point (the single specimen from each locality not satisfactorily determined).

Worn specimens are similar to *E. Sandwicensis*, Pease, but are broader, and more inflated posteriorly with a shorter and more abrupt spire; the resemblance to *E. nana* is greater, but the broader squared-shoulder distinguishes the fossil. Unworn examples are like to a dwarfed *E. lachryma*, except for the conspicuous posterior angulation of the outer lip.

Marginella micula, mihi, a cohabitant species, very closely simulates this *Erato*.

2. Erato australis, *Tate*.

Reference.—Op. cit., p. 96, 1878.

Shell elongate-oval, fusiform, acute at both ends; spire acutely conical, rather elevated.

Whorls five, body-whorl rotundately angled in front of the suture and constrictedly attenuated at the front. Spire-whorls slightly convex, ending abruptly in a small flattened pullus of one and a-half exceedingly narrow whorls.

Aperture rather narrow, slightly insinuated behind, narrowed at the front. Outer lip moderately thickened and inflected, ascending to the middle of the penultimate whorl, with about 20 tooth-ridges. Columella with four (usually), slender, oblique rounded thread-like ridges succeeded behind by a few denticles (not always developed).

Dimensions.—Length, 8; width, 4·25; height, 4 (at 4 mm. from the posterior end).

Localities.—Eocene. Aldinga Cliffs and Adelaide-bore (very common); rare at Spring Creek!

3. Erato pyrulata, *spec. nov.*

Shell pyriformly ovate, tumid, the right side steeply sloping, the left somewhat inflated; highest near the posterior end, steeply rounded to the very short spire of three depressed whorls (in senile examples, callously covered), rapidly attenuated to the front.

Aperture moderately wide, nearly straight, but widest and emarginate behind, narrowed to the short anterior canal. Outer lip thickened and reflected, its inner margin with from 14 to 16 short prominent tooth-ridges; bent at right angles to meet the spire on which it extends or projects beyond it, thence it is straight to the front.

Inner lip angulated, with small denticles on the keel behind the twisted columella-plait which runs out on the short beak as an elevated margin.

Dimensions.—Length, 7·5; width, 5; height, 4 (at 2·5 mm. from posterior end).

Localities.—Aldinga Cliffs and Adelaide-bore.

E. pyrulata is not well placed generically, its terminal spiral plait on the columella, running out to form the left margin of a slightly effuse canal, recalls *Marginella* and *Cypræa*, and to some extent *Ovulum*; but as it presents, in the adult, the characteristic angulated and denticulated inner lip of *Erato*, I am unwilling to establish a new genus for it and the two following species

possibly on a more extended knowledge of the recent and fossil species of *Erato*, this may prove a desirable course.

The denticles on the two lips appear when the adult stage is reached, but the columella-plait belongs to all ages. In its adolescent stage this species resembles *Marginella edentula*, mihi, a more inflated shell with a convex pillar. The present species differs in shape, being broader and more truncated behind, from all living forms.

4. Erato Morningtonensis, *spec. nov.*

Similar to *E. pyrulata*, but is not so tumid, has a longer and more gradually attenuated body-whorl, is more pointed behind, the outer lip with a broadly-rounded shoulder and slightly incurved towards the front.

The columella has only two or three denticles behind the terminal plait.

Dimensions.—Length, 6 ; width, 3·5 ; height, 3 (at 2·5 mm. from the posterior end).

The proportional measures of the two species are :—

E. Morningtonensis—Length, 100 ; width, 58·3 ; height 50.

E. pyrulata—Length, 100 ; width, 71·4 ; height, 57·1.

Locality.—Eocene clays ; Schnapper Point, near Mornington.

5. Erato duplicata, *Johnston.*

Reference.—Geol. Tasmania, tab. 31, fig. 14 ; no description (1888).

Shell minute, cylindric-oblong, bluntly pointed at both ends; dorsal profile, flatly convex on the right, rounded and narrower on the left ; spire very short and blunt.

Aperture moderately wide, nearly straight. Outer lip narrowly inflected, somewhat abruptly arched behind, spreading callously on the spire ; denticulate ridges narrow, about 14. Inner lip slightly angled, with a row of small denticles on the keel, exterior to which are a few scattered denticles and ridges forming an irregular outer row. Columella extending internally as a high, slightly concave, smooth plate, the anterior edge of which runs out into an oblique plait, sulcate at the tip, margining the anterior canal.

The high columella-plate with its anterior plait-like margin recalls *Cypræa ;* but as the unique example seems somewhat immature it may be unsafe to speculate on its probable generic position, and so I leave it as originally placed.

Dimensions.—Length, 5·5 ; width, 3·5 ; height, 3.

Locality.—Eocene ; Table Cape *(R. M. Johnston !).*

6. Erato (Eratopsis) illota, *spec. nov.*

Shell minute, pyriform-ovate ; spire short, obtusely pointed ;

whole shell, except a broad dorsal sulcus, covered with a smooth enamel. Outer lip broadly inflected, not margined, smooth, with eighteen to twenty narrow tooth-ridges; inner lip with three stout oblique ridges at the front, which are succeeded by denticles.

Dimensions.—Length, 4; width, 3; height, 2·5.

Locality.—Miocene; Muddy Creek.

The few specimens under observation are slightly worn, and may be mistaken for rolled examples of *E. minor*. In *Eratopsis* it comes nearest in shape to *E. nana*, but it is broader, shorter, and not granulated.

FAMILY OVULIDÆ.

GENUS SIMNIA, *Rissoa* (1826).

Simnia (Neosimnia) exigua, *spec. nov.*

Shell narrow-elongate, a little more than four times at long as wide, shortly rostrate, and straight at both ends; tapering regularly towards the bluntly-rounded posterior end from a point between a third and a fourth of the whole length from the front; obliquely subtruncated anteriorly. Viewed from above, the left profile is slightly arched, being almost straight; on the right it is nearly straight in the medial-third, thence gently curving to the extremities, but more rapidly behind than to the front. The surface is smooth, and beautifully spirally wavy-striate.

The aperture is very narrow behind, gradually widening from about the middle to near the front, where it again narrows, though somewhat dilated.

Columella distinct, sharply truncate in front, with a wide canal; posteriorly with a strong oblique callous fold.

Outer lip thickened, margined externally, edentulous, medially straightish, gently curved to the very short effusively dilated posterior canal, abruptly curved to the short anterior canal.

Dimensions.—Total length, 11·5; greatest width, 2·75; height, 2.

Locality.—Eocene; Muddy Creek.

By its narrow outline and short rostral prolongations the present species comes nearest to *S. acicularis*, Lamarck, of the West Indies, but apart from the posterior fold it appears to be a narrower shell; *S. lanceolata*, Sow., is narrower, but the extremities are longer in proportion to the enrolled portion of the shell, and it lacks the posterior fold. Not one of the recent species included in the Section Neosimnia has the narrow profile of this fossil-species; Dall* remarks of *Neosimnia* that "it is a convenient section of *Simnia*, but the distinction between the two is very

* Blake-Mollusca, vol. II., p. 234.

slight in some species, and it sometimes happens that one might easily assign the same species to one or the other, according to the stage of growth which it has attained." Having regard to the opinion of this distinguished conchologist, I have made my comparisons among species of the genus in its widest acceptation.

FAMILY SCALARIIDÆ.

The Australian Tertiary species of this family belong to two well-defined genera, *Crossea* and *Scalaria*.

Crossea contains the turbinate species with an entire peristome, the columella slightly produced and infolded to form a short canal, the umbilicus more or less concealed or margined by a funicular rib; the genus has certain affinities conchologically with *Ethalia*, and some species of *Rissoina* and *Lacuna* simulate it in their apertural characters.

Scalaria, used in its widest sense, contains the more or less pyramidal species, without the canaliculate aperture; it numbers about 400 species, recent and fossil, and there is great need for the dismemberment of the genus to facilitate specific reference. The Eocene-species of France have been arranged by MM. De Boury and Cossmann into several genera and numerous subgenera; and though the subdivision is perhaps rather strained, yet I have largely availed myself of their classification in the elaboration of our Tertiary species. I do not altogether appreciate the relative values of their genera and subgenera; and find it convenient to admit only *Scalaria* as of generic value, though its species seem to fall naturally into two chief groups—*Scalaria* (sensu stricto) with an entire aperture and *Acirsa* with its incomplete peristome.

Genus Crossea *A. Adams* (1865).

SYNOPSIS OF SPECIES.

Outer lip plain; shell depressed turbinate; spire-whorls punctate. 1. *C. princeps.*

Outer lip varied.

Conic-turbinate, lirate. 2. *C. sublabiata.*

Globose-turbinate, smooth or obsoletely linear-sulcate at the base. 3. *C. lauta.*

EXCLUDED SPECIES.

Crossea parvula, *Tenison-Woods*, is transferred to *Collonia*.

The genus has hitherto been unknown in a fossil state, being represented by six species, two inhabiting Japanese and four the Australian seas. These species fall into three sections, to two of which the fossil-species belong; all are briefly indicated in the following synopsis:—

I. Shell with several varices.

C. miranda, A. Adams. Recent; Japan.

II. Shell with a variced lip.

C. labiata, Tenison-Woods. Recent; Tasmania, S. Australia.
C. sublabiata, Tate. Eocene; Australia.
C. lauta, Tate. Miocene; Australia.

III. Shell with a simple lip.

1. Whorls punctate (at the least the posterior ones).
   C. concinna, Angas. Recent; N.S. Wales.
   C. princeps, Tate. Eocene; Australia.
2. Whorls cancellate.
   C. bellula, A. Adams. Recent; Japan.
   C. cancellata, Tenison-Woods. Recent; Tasmania.
   C. striata, Watson. Recent; N.E. Australia.

1. Crossea princeps, *spec. nov.*

Shell depressedly conoidal, rather solid, polished, of five rounded whorls.

Apex of one and a half smooth narrow depressed concave whorls; the next whorl is flattened in the posterior-half and ornamented with a few spiral rows of large punctations. With the revolution of the spire the rapidly increasing whorls become convex, the lines of punctations increase, and the punctures become smaller and numerous; finally at about the half-turn of the penultimate whorl the punctated ornament disappears.

The last whorl is smooth, convex, finely transversely striated, and faintly spirally lined; whilst the anterior suture is bordered by a narrow, somewhat ascending ligatural band, which continues on to the penultimate for about a half-turn; a few spiral punctate striæ appear on the base.

Aperture circular, outer lip simple, inner lip double. Columella with a narrow triangular excavation on its inner face, extending from about the middle position to the front, where it is interrupted by an oblique tooth-like plait, which defines the outer margin of a very short canal, supported by the basal funicular rib.

The narrow umbilical chink is bordered by a rounded stout, elevated funicular rib, which ends at the inner basal angle of the aperture, and on which the apertural canaliculation is formed.

Dimensions.—Length, 4.25; width, 4·25; height of aperture, 2·5; width of aperture, 2·25.

Localities.—Eocene. Adelaide-bore!; River Murray Cliffs near Morgan!; Muddy Creek!

This neat species is the fossil analogue of *C. concinna*, Angas, but in that species the posterior whorls are strongly lirate and

cancellate, whilst the ordinary spire-whorls are conspicuously and broadly flattened behind, but are without an infra-sutural ligature.

2. Crossea sublabiata, *spec. nov.*

Synonym.—*Crossea labiata*, Tenison-Woods, Proc. Roy. Soc., Tasmania, for 1876 (name only); *id.*, Johnston, P. R. S., Tasm., for 1884, p. 221.

Shell conoidal-turbinate, somewhat solid; spire elevated; whorls five, rounded, and distantly, irregularly and coarsely spirally-lirate; suture distinct.

Body-whorl relatively very large; aperture oval, posteriorly angulate, obtusely angled and obsoletely channelled at the columella-margin; outer lip varicosely dilated. Umbilical chink narrow and deep, bordered by a rounded not very prominent funicular rib.

Dimensions.—Length, 4; width, 2·5; height of aperture, 2·5; width of aperture, 1·5; unusually large specimens have a length of 5 mm.

Localities.—Eocene. Muddy Creek!; Table Cape *(Hobart Mus.)*.

The Table Cape-specimens of this fossil species were originally referred by Tenison-Woods to his *C. labiata;* and were subsequently carefully compared by Mr. Johnston with an extensive collection of the living forms, who remarks, "That although the fossil representatives are decidedly larger than the living ones, there are no characteristic differences between them so far as the tests are concerned, if we except the fact that in the living form the varix is generally sharper and more decidedly reflexed. In the fossil representatives the striæ upon the varix are almost obsolete and consequently the latter has not that appearance which Mr. Woods describes as 'fringe-like.' So far as the trifling differences go, I must admit that they are sufficiently constant to enable a careful classifier to recognise the living from among the fossil representatives with a considerable degree of confidence."

After a minute comparison of an extensive suite of specimens of *C. labiata*, including authentic examples from Tasmania, with many examples from Muddy Creek; I can confidently endorse the opinions of Mr. Johnston, touching the differential characters of the two, though at the same time I fail to recognise the "fringe-like" varix described by Mr. Woods, probably his type is only an extreme individual development. In addition to the angular outer margin of the broader varix of the living species, I have recognised that the lirate ornament is very fine and close, whilst it is coarse and distant in the fossil. With these two characters one cannot fail to separate the living from its fossil representative—characters which I regard as of specific value.

I have not seen examples from Table Cape, but there cannot be any doubt that they are conspecific with the Muddy Creek types of *C. sublabiata.*

3. Crossea lauta, *spec. nov.*

Shell globosely turbinated, with a large tumid body-whorl and very low broad conical spire.

Whorls four, convex, smooth and shining. Body-whorl with a narrow infrasutural band and a few obsolete linear-sulcations at the base. Aperture broadly oval; outer lip stoutly variceally thickened, sharply margined behind; columella much arched; umbilical chink wide and deep, bordered by a stout, rather sharply elevated, furnicular rib.

Dimensions.—Length, 3; width, 3; height of aperture, 2; width of aperture, 1·5.

Locality.—Miocene. Muddy Creek!

C. lauta somewhat resembles in shape *C. princeps*, but has a variced outer lip; in which latter character it agrees with *C. labiata* and *C. sublabiata*, but is readily distinguished from them by its globose profile.

Genus Scalaria.

synopsis of species.

I. *Peristome entire; no basal rib.*

1. Shell costated, with or without varices; aperture circular [Clathrus].
   No varices; costæ lamellar; spirally lineate, 1. *S. interstriata.*
2. Shell variced; *spirally linear-punctate-grooved;* peristome thick [Nodiscala].
   Whorls subangular; costæ thick, evanescent behind. 2. *S. basinodosa.*
   Whorls rounded.
   Suture crenate-dentate; coarsely punctured. 3. *S. prionota.*
   Suture plain; finely punctated. 4. *S. Hamiltonensis.*
3. Shell lamellate-costated; with or without varices; umbilical chink margined by a *funicular rib adherent to the pillar* [Crisposcala].
   Lamellæ distant, pointed behind; spirally lirate and striate. 5. *S. echinophora.*

II. *Peristome entire; base with a concentric rib.*

4. Shell lamellate-costated, with or without varices; impunctate; basal keel ending at inner angle of aperture adjacent to the funicular rib [Circuloscala].

Costæ lamellose, near together. 6. *S. foliosa.*
Costæ filiform, varices prominent; fenestrated; whorls almost disjointed. 7. *S. orycta.*

5. Shell costated and variced, *punctate;* basal keel ending at inner angle or middle position of aperture [PUNCTISCALA].
Whorls medially angulated; shell turrited; spirally finely-lirate. 8. *S. loxopleura.*
Whorls not angulated.
Shell elongate-turrited.
Whorls convex, spirally lirate.
9. *S. bulbulifera.*
Whorls flattish, spirally linear-sulcate.
10. *S. eritima.*
Shell pyrimidal; whorls slightly convex, spirally wavy-striated, costæ dentate at posterior suture.
11. *S. microrhysa.*

6. Shell costated and variced, impunctate; basal keel ending at outer angle of aperture [CIRSOTREMA].
Costæ filiform; coarsely lirate, subgranose at intersections.
12. *S. transenna.*
Costæ lamellose; spirally lirate and striated.
Lamellæ lamellose, straight-edged.
13. *S. Mariae.*
Lamellæ crowded, frilled. 14. *S. pleiophylla.*

III. *Peristome incomplete.*

7. Periphery angulated, aperture subquadrate, columella flattened and angulated in front, base lirate; shell thick, tessellated, without varices [EGLISIA].
15. *S. triplicata.*

8. Periphery angulated, aperture oval; shell thin, cancellated, with or without varices [ACRILLA].
Base disk-like.
Shell smooth, minutely umbilicated.
16. *S. inornata.*
Shell costated, imperfectly variced.
17. *S. pachypleura.*
Base subangulated and lirate.
Costæ filiform and distant.
Whorls convex.
Tessellated by equal liræ and costæ.
18. *S. escharioides.*
Costæ stout, liræ slender; apical whorls angulated. 19. *S. glyphospira.*
Costæ thick; spirally linear-sulcate; apical whorls bulbiform. 20. *S. mutica.*

Costæ stout, liræ feeble; pullus pyramidal, whorls convex. 21. *S. cylindracea.*

Whorls shouldered, trilirate in front, smooth behind; pullus subcylindrical. 22. *S. gonioides.*

Costæ lamelliform and crowded. 23. *S. crebrelamellata.*

9. Periphery rounded; aperture oval; shell stout, costated, lirate and variced [HEMIACIRSA].

Costæ and liræ few and stout. 24. *S. lampra.*

Costæ and liræ more numerous, slender. 25. *S. polynema.*

1. Scalaria (Clathrus) interstriata, *sp. nov.*

Shell turrited, small, slender, acute, thin, translucent, imperforate; ordinary whorls eight, convex, separated by a deep suture; nuclear whorls three, smooth, gradually attenuate to the tip.

The transverse ornament consists of thin, moderately elevated, oblique lamellæ which are continuous from whorl to whorl; there are 17 to each of the anterior whorls. Varices absent. The spiral sculpture consists of intercostal incised lines.

Aperture circular; peristome entire; outer lip thin, reflected, formed by the last costal-lamella. Base convex, traversed by the costæ, without a basal keel or funicular rib.

Dimensions.—Length, 11; width, 3; diameter of aperture, 2.

Locality.—Eocene; Muddy Creek (*J. Dennant;* very rare).

This is the oldest-known species of the subgenus, which according to M. de Boury did not appear till the Miocene; from the Italian Miocene and Pliocene species, it is distinguished by its more numerous and thin costæ. If we admit the subgenus *Hyaloscala*, De Boury (1890), which includes the thin and transparent species of *Clathrus*, then our fossil has few alliances, it most resembles the elate variety of *S. Jukesiana*, which has, however, no intercostal spiral striations.

2. Scalaria (Nodiscala) basinodosa, *spec. nov.*

Shell very small, slender, acute, solid, imperforate, with six ordinary whorls and two and a half smooth shining rounded nuclear whorls.

Spire-whorls slightly convex, with an angulated profile by reason of the medial enlargement of the costæ. The spiral ornament consists of crowded punctated engraved lines, and a narrow band, crenated on the margin, at the anterior edge of the suture to which it is closely appressed. The transverse ornament consists of slightly angular and medially thickened ribs (12 on the penultimate whorl), which do not reach the posterior suture; on

the anterior-half of the body-whorl, the ribs are reduced to stout nodosities. There are three stout varices on the spire.

Aperture nearly circular; peristome complete with a groove around its inner margin, the exterior of the outer lip formed by the very thick varix; base rounded.

Dimensions.—Length, 4·5; width, 1; height of aperture, 1.

Locality.—Eocene; Muddy Creek *(one ex.)*.

This species is separable from *S. Hamiltonensis*, by its smaller size, slenderness, and discontinuity of the costæ, &c.

This and the next two species I have referred to De Boury's genus *Nodiscala*, despite the absence of a basal disk, though some of De Boury's species which have the disk feebly developed may be regarded as connecting these extreme forms with the typical species.

3. Scalaria (Nodiscala) prionota, *spec. nov.*

Shell turrited, slender, acute, stout, imperforate; ordinary whorls eight, slightly convex, costated and sparsely variced; nuclear whorls unknown.

The transverse ornament consists of stout rounded nearly straight costæ, which are a little produced upon and adpressed to the preceding whorl, so that the sutural line is conspicuously sinuate-dentate; on the body-whorl they extend on to the base, are a little angulated and nodosely enlarged at the periphery. There is only one varix on the spire. The spiral ornament consists of very narrow flat threads, with linear punctated interspaces (about 20 on penultimate whorl), which are continuous across the costæ.

Aperture obliquely oval; peristome entire, grooved around; the exterior lip formed by the very thick varix. Base rounded, without carina or special sculpture.

Dimensions.—Length, 8; width, 2·5; length of aperture, 2.

Locality.—Eocene. Muddy Creek *(one ex.)*.

S. prionota differs from *S. Hamiltonensis* in being less slender, coarsely punctated, and by its crenate-dentate suture.

4. Scalaria (Nodiscala) Hamiltonensis, *spec. nov.*

Shell elongate-turrited, acute, stout, imperforate; ordinary whorls seven; flatly convex, costated and sparsely variced, suture linear; nuclear whorls two, smooth, rounded. The transverse ornament consists of thick, filiform, nearly straight costæ, slightly attenuated at the posterior suture, but continuous from whorl to whorl; on the anterior-half of the body-whorl, they are slightly nodosely elevated in the middle, but are evanescent at the base; there are about 10 on the body-whorl, but about 12 on the penultimate-whorl. Varices very irregularly disposed rarely more than two or three on the spire.

The spiral ornament consists of crowded regular linear punctated grooves.

Aperture oval, oblique, almost lunate; peristome entire, with a groove around its inner margin, outside of which is the punctated face of the very thick varix. Base convex or slightly depressed, without a distinct basal keel.

Dimensions.—Length, 8; width, 2·25; length of aperture, 2.

Locality.—Eocene. Muddy Creek (not rare).

6. Scalaria (Crisposcala) echinophora, *spec. nov.*

Shell broadly turrited, thin, acute, imperforate, with eleven normal whorls and three smooth shining tumid nuclear whorls.

Spire-whorls very convex, but by reason of the posterior truncation of the costæ the profile is gradated.

The transverse ornament consists of numerous (about 20 on the anterior whorls) oblique, elevated, frilled, lamelliform costæ, usually composed of two or three connate lamellæ; the costæ are roundly shouldered at the posterior two-thirds, and are extended there into an erect short-lanceolate plate; there are no proper varices.

The spiral ornament consists of broad, subacute, prominent liræ; the angular and narrow interstitial furrows are sculptured by a few distant linear spiral grooves.

Aperture circular; peristome complete; columella margined externally by a narrow funicular rib which runs-out to the tip of the slightly flattened and expanded columella; the base is rounded.

Dimensions.—Length, 20 (estimated); width, including costæ, 6; width of aperture, 3.

Localities.—Eocene. River Murray Cliffs!; Corio Bay, near Geelong!

S. echinophora has some analogy with *Crisposcala junctilamella* of the Paris-basin, but it is more elongated, and is further distinguished by its frilled lamellæ and spiral liræ. It might be mistaken for *S. foliosa*, *S. Mariæ*, or *S. pleiophylla*; but the absence of a basal keel at once separates it.

6. Scalaria (Circuloscala) foliosa, *spec. nov.*

Shell rather large, somewhat thin, imperforate. Similar to *S. echinophora*, but the lamellæ are more numerous (25 and two thick varices on the body-whorl), less apiculate at the rounder shoulder.

Aperture nearly circular, a little higher than wide; peristome complete; outer lip broadly and varicosely expanded, crenated on the sharp margin. Columella margined by a funicular rib, in close contiguity to which is a revolving rib which terminates at the inner angle of the aperture.

This species is intermediate between *Criposcala* and *Circuloscala*, the basal rib which is in an alignment with the posterior angle of the aperture terminates a little in front of the umbilical funiculus, and not at the outer angle of the aperture, as in *Circuloscala*. It has very distinctive characters, though simulating *Crisposcala echinophora* and *Cirsotrema pleiophylla*.

Dimensions.—Length, unknown; height of body-whorl, 8; width of body-whorl, 6; of aperture, 2·25.

Locality.—Blue clays at Schnapper Point!

7. Scalaria (Circuloscala) oryeta, *spec. nov.*

Shell rather thin, elongate, imperforate; whorls very convex, almost disunited, variced, tessellated by thick spiral liræ and filiform costæ.

The spiral ornament consists of broad flat equidistant liræ alternating with smooth and somewhat-wider interspaces; on the penultimate whorl, there are five medial threads, succeeded anteriorly by four narrower ones, and on the posterior area there are about eight threads.

The transverse ornament consists of slightly-arched filiform costæ which by intersection with the liræ produce rectangular interspaces on the medial and anterior areas; there are two thick filiform varices to each whorl.

Aperture circular; peristome entire; base rounded, interrupted by a raised convex anti-peripheral rib, dentate-serrated by the costæ passing across it; columella margined by an adherent funicular rib.

The species has very distinctive characteristics.

Dimensions.—Length, unknown; width of body-whorl, 3·5; height of body-whorl, 5·5; of aperture, 2·5.

Locality.—Eocene; Muddy Creek!

8. Scalaria (Punctiscala) loxopleura, *spec. nov.*

Shell stout, rather slender, imperforate; ordinary whorls six, medially subangulated, separated by a well-defined linear suture; apical whorls unknown.

The spiral ornament consists of numerous (about 20 on the penultimate whorl) crowded undulose threadlets, separated by slightly-narrower punctated linear grooves.

The transverse ornament consists of stout-filiform, oblique and slightly-bent costæ (about 20 on the penultimate whorl), which are crenulated by the spiral liræ; there are about three very prominent oblique varices on the spire.

Base angulated by a broadish depressed keel which is nodosely-crenulated by the costæ; the area in front of the basal keel is slightly concave and concentrically lirate. Aperture circular;

peristome entire, the outer margin of which is bordered by the punctate-lirate face of an elevated varix.

Dimensions.—Length, 5 ; width, 1·5.

Locality.—Eocene ; Adelaide-bore (4 exs.).

9. Scalaria (Punctiscala) bulbulifera, *spec. nov.*

Shell small, slender, acute, solid, imperforate ; ordinary whorls seven and a-half, moderately convex ; nuclear whorls two, smooth, very tumid, disproportionately large, the last one and a-half forming an obtuse bulbiform apex to the spire.

The spiral sculpture consists of linear sulcations or flattened crowded threads (about 15 on the penultimate whorl) ; the extremely narrow interspaces are punctate, at least those on the last and penultimate whorls.

The transverse ornament consists of rather stout, subacute medially thickened, slightly oblique costæ, about 10 on each of the anterior whorls ; and of elevated, narrow rounded varices, two on each whorl. The spiral threads pass across the costæ but are interrupted by the varices.

Aperture circular, with a groove around its inner margin, outside of which is the punctate-striated anterior face of the elevated varix. Base slightly concave, defined by a strong keel, concentrically finely striated.

Dimensions.—Length, 6 ; breadth, 2 ; aperture, 1.

Locality.—Eocene ; not rare at Muddy Creek ; worn and probably derived in Miocene-beds at the same place.

10. Scalaria (Punctiscala) eritima, *spec. nov.*

Shell stout, elongate, acute, imperforate ; ordinary whorls 11, flatly convex, suture partially concealed by the crenatedly-extended margin of the preceding whorl ; apical whorls three, very convex, of gradual increase.

The spiral ornament consists of punctated linear sulcations (about 20 on the penultimate whorl), rather crowded in front of the suture, but about twice the width of the linear furrows on the rest of the whorl.

The transverse ornament consists of nearly straight, rather thick and elevated, convex costæ, slightly denticulatedly-produced at the posterior suture, but are in an alignment from whorl to whorl ; there are about 12 costæ to a whorl, and five or six prominent varices on the spire ; both costæ and varices are crossed by the spiral grooves.

Base angulated by a prominent keel, widely crenulated by the costæ ; the anti-peripheral area is narrow and abruptly concave, somewhat undulose transversely, concentrically punctatedly-grooved.

Aperture circular ; peristome entire, with a groove around its

inner margin, outside of which is the punctated-sulcated and transversely striated anterior face of the elevated varix.

Dimensions.—Length, 13 ; width, 3 ; diameter of aperture, 1.

Locality.—Eocene ; Muddy Creek !

11. Scalaria (Punctiscala) microrhysa, *spec. nov.*

Shell stout, pyramidal, obtuse, imperforate ; ordinary whorls five and a-half, flatly convex ; suture deep, partially concealed by the protuberant costæ of the preceding whorl ; apical whorls two and a-half, the median portion of the pullus very tumid and excentric, the tip is relatively very small and immersed.

The spiral ornament consists of very slender, crowded, undulose threadlets ; the slightly-wider linear interspaces punctatedly-impressed.

The transverse ornament consists of slightly-oblique, broad, convex costæ, extending beyond the posterior suture of the anterior whorls in the form of blunt denticulations ; there are about 14 costæ on the penultimate whorl. The concave intercostal spaces, which are a little wider than the costæ, and the costæ are transversely microscopically striated. There are no varices on the spire.

Base angulated by a broad convex keel ; the anti-peripheral area flat or very slightly concave, concentrically striate, and faintly radially-ribbed. Aperture oval ; peristome completed by a callous growth, but not double ; outer lip formed by a costa.

Dimensions.—Length, 9·5 ; width, 3·25.

Locality.—Eocene. Bird-rock Bluff, Spring Creek, near Geelong *(J. Dennant*, very rare).

The subgeneric position assigned to this species is not satisfactory, though the incompleteness of the aperture may merely indicate an adolescent stage of growth.

12. Scalaria (Cirsotrema) transenna, *spec. nov.*

Shell large, elongate, stout, acute, imperforate, with 11 ordinary moderately convex whorls ; the nuclear whorls not known.

The spiral ornament consists of four or five stout filiform liræ, one median and one on each side of it are about equidistant, the fourth is close to the third, whilst the exsert basal keel forms a fifth, margining the anterior suture, there are a few smaller threads on the posterior area ; the interliral spaces have three or four linear sulcations separated by broad flat threads.

The transverse ornament consists of filiform costæ, not so stout as the stronger liræ, which produce slight nodulations at the intersections with the liræ ; there are 25 costæ on the penultimate whorl, they are slightly oblique, equal, and equidistant. The posterior slope is transversely striated. There are two stout

filiform varices on the spire, they are longitudinally striated and crossed by the liræ.

The base is defined by a rounded peripheral keel; ornamented by irregular-disposed, flat, concentric threads, which are more or less wrinkled, and radially striated and obsoletely costated.

Aperture roundly oblong; peristome complete; columella slightly reflected and projecting, margined externally by a funicular rib; outer lip margined by a very stout varix, lirate and longitudinally striated.

Dimensions.—Length, 21; width, 6; height of aperture, 4; width of aperture, 3.

Locality.—Blue clays at Schnapper Point.

Scalaria (Cirostrema) Mariæ, *Tate.*

References.—*Caloscala Mariæ*, Tate, Southern Science Record, January, 1885, p. 3; *Cirsotrema Mariæ*, De Boury, Etude sur les Sous Genres de Scalidæ, p. 40, 1887.

Shell turrited, about three times as long as wide, imperforate; whorls numerous, convex, suture deep; transversely laminate-costated, variced, and spirally lirate. Costæ lamellar, thin, equidistant, increasing from about 12 to 20 in a whorl with the revolution of the spire.

Varices conspicuous, more elevated than the costæ, subacute on the edge, about one in a whorl, usually two, sometimes three on the body-whorl. Liræ subacute, prominent, equidistant, about 10; the flattish interstitial furrows (a little wider than the liræ) and the liræ are sculptured with a few distant linear spiral grooves alternating with wider depressed threads.

Body-whorl regularly convex to the peripheral rib; base concave, traversed by the costæ and spirally striated.

Aperture circular; peristome entire, varicosely thickened and reflected, with a groove around its inner margin; columella flatly expanded and slightly projecting at the front, where it is supported by an umbilical funiculus which is limited behind by the penultimate varix.

The posterior whorls are occasionally slightly angular, and their ribs and varices are usually subspinosely produced behind near the suture.

Dimensions.—Length, about 35; breadth, 10·5; height of last whorl, 15; diameter of peristome 8, of aperture 5.

Locality.—Eocene; glauconitic limestones of Aldinga Bay.

This species is the type of my subgenus *Caloscala*, which through inadequate appreciation of the characters of *Cirsotrema* I had thought to be different from it; M. de Boury says it is incontestably a *Cirsotrema*, and that it has much affinity with *Scalaria acuta*, Sowerby, of the Hampshire and Parisian Eocene. *S. acuta*

has the whorls flatter behind and is (usually ?) without varices ; but *S. Mariæ* has nearer allies in *S. Zelebori*, Frauenfeld, and *S. lyrata*, Zittel. From the former it is easily separable by its fewer costæ, distinct varices and more elevated and thinner liræ ; from the latter by its more numerous and lamellated costæ.

14. Scalaria (Cirsotrema) pleiophylla, *spec. nov.*

Shell like *Circuloscala foliosa*, but with a distinct basal keel. Its numerous frilled lamellæ separate it from *Cirsotrema Mariæ*.

There are two rounded apical whorls, the first of which is somewhat depressed, and about ten ordinary whorls ; there are 20 to 25 costæ to a whorl.

Dimensions.—Length, 20 ; width, 5·5.

Localities.—Eocene. Adelaide-bore ; Corio Bay and Spring Creek, near Geelong.

15. Scalaria (Eglisia) triplicata, *spec. nov.*

Shell moderately stout, turrited, about four times as long as wide, imperforate ; whorls about 15, of which the two nuclear ones are roundly angled and obscurely lirate, apex acute ; the earlier spire-whorls medially angulate, the convexity becoming more and more tricarinate with the slow revolution of the spire, more contracted in front than behind. Suture distinct.

The spiral ornament consists of three prominent elevated rounded liræ, which are equidistant and approximate, the middle one is the stouter and is slightly in front of the middle line of the whorl ; a small thread is interposed between the posterior carination and the suture.

The transverse or axial ornament consists of thin slightly elevated lamelliform costæ, equal and equidistant, about 25 to a whorl, are continuous from whorl to whorl and become wider apart with the revolution of the spire ; the lamellæ are oblique, but curved forward at and decurrent with the posterior suture. There are no varices.

Body-whorl with four strong liræ, the anterior one in an alignment with the suture (though there concealed) forms a basal keel ; base flatly convex, with about 10 concentric threads, crossed by radiating threads continuous with the lamelliform costæ.

Aperture squarely rounded, peristome incomplete ; outer lip thin ; columella reflected and slightly effusedly dilated at the front.

Dimensions.—Length, 28 ; width, 7 ; height and width of aperture, 5.

Localities.—Not uncommon in the Miocene-strata at Muddy Creek ; and at Red Bluff, Gippsland Lakes. Also Older Pliocene ; Croydon-bore, near Adelaide.

I have attached this species to *Eglisia*, because of the close

resemblance, judging by figures, it bears to the recent *E. tricarinata*, and in a less degree to the extinct *S. (Eglisia) impar*, Deshayes; from the first it is distinguished by the absence of a slight shoulder to the whorls and by its conspicuous tessellated ornament, whilst the latter species is quadrilirate and very small.

Our Australian fossil presents many points of resemblance to *Acrilla*, but is devoid of the disk-like base; and as a whole the characters are rather those of *Scalaria* than of *Turritella*.

16. Scalaria (Acrilla) inornata, *spec. nov.*

Shell minute, thin, very slender; with eleven, smooth, rather tumid, slowly-increasing whorls.

Base disk-like, spirally lineate, margined exteriorly by a thread-like rib; slightly perforated. Aperture quadrately rounded.

Dimensions.—Length, 3·75; width, 0·75.

Locality.—Eocene; Table Cape, Tasmania (2 exs.).

17. Scalaria (Acrilla) pachypleura, *spec. nov.*

Shell thin, elongate-turriculate, imperforate; ordinary whorls eight, convex, separated by a moderately deep suture; pullus of two smooth rounded whorls, the first slightly angulated and depressed.

The ornament consists of flat spiral threads crossed by slightly more-distant, thicker, and rounder costæ; the rectangular interliral spaces, which are a little longer in a spiral direction than wide, have a double row of three to four punctures; there are about 30 costæ and 15 liræ on the penultimate whorl, and five or six varices on the spire.

Base flattened, smooth, margined externally by an acute thread. Aperture roundly oblong, peristome incomplete, outer lip thin.

Dimensions.—Length, 11·5; width, 3; height of aperture, 2·25.

Locality.—Eocene at Muddy Creek.

This species has a close resemblance to *Scalaria reticulata*, Solander (*S. decussata*, Lamk.); but on a comparison of actual specimens, our fossil differs from the Hampshire and Parisian one by its thicker costæ, finer and more numerous spiral threads, by its varices and more slender form, and particularly by the punctures.

18. Scalaria (Acrilla) escharoides, *spec. nov.*

Shell thin, slender, imperforate; ordinary whorls seven, rather flat, tessellated; pullus rather large, consisting of two smooth rounded corrugated whorls.

The spiral ornament consists of stout flat threads, increasing from six in the posterior whorls to ten in the penultimate whorl; the spirals are crossed by slightly-oblique costal threads, usually not so stout as the liræ, somewhat granosely thickened at the intersections; there are about 25 costæ on the penultimate whorl.

Body-whorl convex, with a flattish base defined by the anterior spiral; anterior to the peripheral angulation, there are three or four encircling threadlets. Aperture oval, outer lip thin.

Dimensions.—Length, 7; width, 1·75; height of aperture, 1·5; an incomplete example has a greatest width of 2·5.

Locality.—Eocene; Muddy Creek!

19. Scalaria (Acrilla) glyphospira, *spec. nov.*

Shell minute, thin, slender, imperforate; ordinary whorls five, moderately convex, strongly costate and slenderly lirate; the apex is obtuse, and consists of two and a-half smooth large angulated turns.

The costæ are filiform, prominent, and slightly arched, equal and equidistant, about 12 on the body-whorl. The spiral ornament consists of narrow subacute threads, separated by wider intervals, about 9 on the penultimate whorl; the liræ do not cross the costæ.

Body-whorl convex with a flattish spirally-lineate base, which is margined by the anterior spiral-thread. Aperture oval, outer lip thin.

Dimensions.—Length, 4; width, 1.

Locality.—Eocene; Muddy Creek.

20. Scalaria (Acrilla) mutica, *spec. nov.*

Shell small, elongate-turriculate, imperforate; ordinary whorls six, moderately convex, costated and spirally lineate-sulcate; apex obtuse, consisting of two smooth convex whorls.

The costæ are moderately stout, distant, ten on the body-whorl; the intercostal spaces with about four to six engraved spiral lines. Base of body-whorl flatly-rounded, obscurely lirate, and subangulated on the periphery: aperture oval.

Dimensions.—Length, 5; width, 1·25.

Locality.—Eocene; Muddy Creek! (not uncommon).

21. Scalaria (Acrilla) cylindracea, *spec. nov.*

Shell small, rather stout, turriculate, imperforate; ordinary whorls eight, almost flat, costated, and obscurely lirate; nuclear whorls four, gradually tapering to an acute apex.

The costæ are stout, nearly straight, about ten to a whorl; the intercostal spaces with about five slender spiral threadlets. Base subangulated, obsoletely spirally-lirate; aperture oval.

Dimensions.—Length, 5 5; width, 1·75.

Locality.—Eocene; Muddy Creek.

22. Scalaria (Acrilla) gonioides, *spec. nov.*

Shell minute, thin, elongate-turriculate, imperforate; ordinary whorls angulated post-medially, costated, and lirate; nuclear whorls two, smooth, shining, somewhat-tumid.

The costæ are subacute, moderately elevated, slightly angulated post-medially. The median area of each whorl with three flattish equidistant liræ; there is a slender threadlet at the anterior suture, but the posterior slope is smooth. There are four stout liræ on the median portion of the body-whorl, the anterior one of which forms a basal keel; the base is ornamented with three distant, encircling, filiform liræ. Aperture quadrately oval, outer lip thin.

Dimensions.—Length, 4; width, 1,

Locality.—Eocene; Muddy Creek! (very rare).

23. Scalaria (Acrilla) crebrelamellata, *spec. nov.*

Shell rather thin, very slender, imperforate; ordinary whorls nine, flat, with a slightly channelled suture; nuclear whorls two and a-half, the anterior one much contracted and ornamented with crowded oblique threadlets, the next is inflated and smooth ending in a bulbiform tip.

The transverse ornament of oblique, crowded, short, erect lamellæ, which are usually so dense as to conceal the suture and the spiral ornament; the latter consists of five, equi-distant, equal, narrow, elevated, flat-edged liræ.

Body whorl with six spiral liræ, the anterior one interrupting the convexity of the base; base with a strong spiral thread and radially striate.

Dimensions.—Length, 9; width, 2.

Locality.—Eocene; Muddy Creek (very rare).

24. Scalaria (Hemiacirsa) lampra, *spec. nov.*

Shell *Turbonilla*-like, subulate-turrited, stout, smooth and shining; ordinary whorls about 10, nearly flat, costated, varied and spirally linear-grooved; apex pointed of about two small convex whorls.

The costæ are straight, slightly oblique, subacute and moderately raised, separated by much wider concave interspaces; from about 12 to 15 in each whorl. The varices are broad and rather depressed.

The spiral ornament consists of flat grooves, with wider flat interspaces, somewhat irregularly disposed and varying from about five to eight in number.

Base convex, concentrically wrinkled-grooved; aperture oval, well-rounded at the front; outer lip thin, margined behind by a varix; columella slightly thickened internally.

Dimensions.—Length, 12; breadth, 3; diameters of aperture, 2·25 and 1·75.

Locality.—Eocene; not uncommon in the *Turritella*-bands, Blanche Point, Aldinga Cliffs.

25. Scalaria (Hemiacirsa) polynema, *spec. nov.*

Shell subulate-turrited, stout, smooth, shining, imperforate; ordinary whorls about nine, nearly flat, feebly costated and variced, spirally striate; apex unknown.

The costæ are slightly arched, subacute, slender, separated by as wide concave interspaces, about 18 on the anterior whorls; varices broad, depressed, about six on the spire.

The spiral ornament consists of slender subacute threads, separated by equally-wide incised furrows, about 12 to 15 on the anterior whorls. The suture is concealed by a narrow ante-sutural band, most conspicuous on the anterior whorls.

Base convex, concentrically lirate; aperture oval, well-rounded at the front; outer lip rather thin, margined-behind by a varix; columella slightly-thickened internally.

Dimensions.—Length, 9; width, 2; an imperfect example width, 3; height of aperture, 2; width, 1·5.

Locality.—Eocene; Bird-rock Bluff, Spring Creek near Geelong.

This species is closely related to the last, differing by its more slender and numerous costæ and liræ.

MISCELLANEOUS CONTRIBUTIONS,

Parasite of the Stick-case Moth *(Entometa ignobilis).*

Mr. Tepper records the larva of a large fly, *Tachina* sp., destructive to the caterpillars of this moth.

On the Protracted Pupation of Antheræa Helenæ.

A female example of this large moth was bred by Mr. Tepper from a caterpillar, which did not emerge from its cocoon till after the lapse of 2 years 8 months and 25 days.

Diprotodon-Remains.

A large skull, one shoulder-blade, one axis, two cervical vertebræ, one nearly complete rib-bone and a portion of the sternum have been added to the Public Museum, exhumed under the direction of Mr. Zietz from a depth of 12 feet below the surface in loam and gravel in the eroded bed of a tributary of the Baldina Creek on the edge of the Eastern Plain.

Foraminifera of the Muddy Creek-Beds.

Mr. W. Howchin reports the following species of *Polystomella* inadvertently omitted from his paper (Trans. Roy. Soc. S. Aust., vol. xii., p. 16.):—

P. striato-punctata, F. v. M. Upper bed, rare.
P. subnodosa, Munster. Upper bed, very common.
P. crispa, Linn. Upper bed, rather scarce.

Poisonous Properties of Euphoria eremophila.

Although this spurge plant has been previously reported as occurring in the Gawler Ranges, I have only met with three plants of it during the past two years at this particular place (Caroona, Lake Gilles). It has not previously been gathered here. The plant is very familiar to me, as I have seen much of it in Queensland and the northern parts of New South Wales. As W. F. M. Bailey, in his work on the Queensland flora, refers to this plant, and writes of it that it is reported to be poisonous to animals, it may be interesting if I refer to the symptoms of

poisoning which I have myself observed on sheep. The plant grows abundantly in low, swampy ground, and should sheep happen to get to it with empty bellies it causes the following symptoms :—On the second day after eating the heads are swollen, the ears drooped, and a yellowish discharge oozes through the pores of the skin. On lancing the skin, a yellowish fluid escapes. In a large percentage of the sheep affected, their ears drop off altogether, whilst others again succumb to its effects and die. I have seen as many as 500 or 600 sheep lying dead on the camp after feeding on this plant. It has not the same marked effect on sheep with full bellies as it has on those that are fasting. A number of the former, however, will suffer severely from its poisonous effects, and even die. The plant appears to be of wide distribution in the province of South Australia, according to the last published census of indigenous flowering plants, by Professor Tate (Transactions and Proceedings, Royal Society S.A., vol. XII.). Its home is essentially the more arid portions of the province, where, from its green appearance, it must often prove a tempting bait to travelling flocks.

H. Sutherland.

Fluorescence of Bursaria spinosa.

It has long been noticed that an infusion of the leaves of *Bursaria spinosa* is strongly fluorescent. On examination this proves to be due to the presence of *Æsculine*, which has been isolated in a crystalline form from the plant, and to which the fluorscence of the bark of the horse-chesnut is also due.

E. H. Rennie.

BIBLIOGRAPHY.

On the Rectification of the Nomenclature of *Hectoria Pontoni*, Tepper.

Dr. F. Karsch, of the Berlin Museum, has identified the foregoing, described in these Transactions, vol. XI., with *Alectoria superba*, Brunner, described and figured in the "Journal d. Museum Godefroy," part XIV., p. 196, 1879, from a specimen obtained at Peake Downs, Queensland.

Additional Species of Australian Fungi.

The following references and translated extracts belong to species of Fungi collected in South Australia by Mr. J. G. O. Tepper, and described by Mr. G. Winter, Prof. P. A. Saccardo, and Dr. F. Ludwig in various European Scientific Journals. The list is largely an addendum to the "Notes on Australian Fungi," published in these Transactions, vol. XII., pp. 150 *et seq.* The extra-provincial records are supplied from Mueller's Fragm. Phyt., vol. II.

Panus lateritius, *Saccardo*, in Hedwigia, XXVIII., p. 125, tab. 2, fig. 4. Dimidate, sessile, orbicular-lunate, membranous, flaccid, with margin at first rather obtusely involute but soon straight, acute, tan-coloured, spotted with punctiform brick-coloured evanscent tufts. Lamellæ somewhat widely apart, few (12 to 20), entire and dimidiate, somewhat narrow, rather hard, subochraceous; basidia subterete; spores ovate-ellipsoid, apiculate at the the base 9 to 10 x 6 to 6·5, smooth, hyaline.

Allied to *P. lunatus*, Fr., and *P. cinnabarinus*, Fr.; but differs from the first by the lateritis squamulose pileus, and from the second by the colour of the pileus.

Boletus subtomentosus, *Frics.* Also in N.S.W.

Trametes hispidula, *Berk* and *C.* Pileus scrupose-tomentellose, when young cervine-fulvous, when old darker, 2 to 3 c.m. broad, concentrically sulcate. Pores bluish-white at the edge ·75 mm. diameter. Allied to *T. hispida*, which is broader, but not so thick, and the pores are scarcely ·5 mm. diameter.

Hexagona durissima, *Berk.* [*Saccardo*, Bull. Soc. Myc. de France, 1890.]

Stereum Kalchbrenneri, *Saccardo;* S. hirsutum, *Fries;* var. glaucellum, *op. cit.;* and S. cyathiforme, *Fries;* var. minor, are diagnosed in Bull. Soc. Myc. de France, 1890.

Cyphella polycephala, Saccardo in Hedwigia, XXVIII., tab. 2, fig. 5. Growing in groups of about four to six, rarely two to three, pilei, closely fasciculate, upheld on a common stipitiform base which is subterete, whitish-brown, glabrous and incrassated upwards. Pileus urceolate, much-closed, woolly-white, minutely roughened upwards with filiform hairs 5 *u* thick; hymenium immature. A minute fungus 1 mm. thick and high.

Cyphella albo-violascens, (*A.S.*), *Karsten.* On vine twigs.

[Cyphella villosa (*Pers.*), *Karsten.* On decayed stems of *Cynara scolymis*, near Melbourne; coll. J. G. O. Tepper.]

Battarrea Tepperiana, *Ludwig;* Bot. Centrabl., XXVII., No. 11; Bull. Soc. Myc. de France, vol. V., p. 34, pl. 5.

Lycoperdon bovistoides, *Saccardo*, Bull. Soc. Myc. de France, 1890.

Uromyces (Uromycopsis) Limosellæ, *Ludwig;* Hedwigia XXVIII., p. 182. Æcidia scattered or united. The masses of pseudospores are whitish with an irregular margin, not deeply sunk. Spores roundish, polyhedral, colourless, smooth, of about 15 *u* diameter. The sori of the teleutospores occur among the peridia although mostly and for long covered by the epidermis, polyhedral, of a dark-brown colour. Teleutospores obovate, oblong, or club-shaped, rarely subglobular, with a yellowish-brown, thick, smooth membrane, thicker and paler at the summit. Spores 32 to 40 *u* long, 18 to 22 *u* wide; pedicel as long as or shorter than the spore. Upon the leaves of *Limosella aquatica*, Karatta, Kangaroo Island.

Uromyces (Pileolaria) Tepperianus, *Saccardo;* Hedwigia XXVIII., p. 126, tab. 2, fig. 1. Teleutospores sphæroidal, depressed, cinnamon-coloured, 20 to 24 by 18 to 20 *u*, longitudinally very thinly and closely canaliculate-striate, crenulate on the margin when viewed in front, nucleate; with long bacillar stipes densely fasciculate, 40 to 60 by 3 to 5 *u*, hyaline, fixed to the base of the teleutospore by a circular hilum. Can be compared with no other species.

Puccinia (Puccinopsis) Saccardoi, *Ludwig;* Hedwigia XXVIII., p. 362. Æcidiæ scattered or united in groups, producing on the leaf circular patches, raised around the margin, which dry up in the interior, of a brownish or yellowish tint, from 2 to 4 mm. in diameter. The pseudo-peridia are dish-like, white, with deeply-impressed margin, about 215 to 325 *u* in diameter; peridial cells finely verrucose, 18 to 25 *u* long and 15 to 18 *u*

broad. Spores polygonal, pale orange, 13 to 15 *u* diameter. Teleutospores roundish or oblong, occasionally grouped around those of the peridia, confluent on the peduncles, &c., generally covered by the epidermis at the border, black. Spores raised upon a pedicel gradually dilating upwards and passing into the lower spore-cell, 50 to 63 *u* long. Lower spore-cell oblong, compressed (laterally dilated to about 18 *u*), about 29 to 33 *u* long, brown ; upper spore-cell wider, almost globular, quadrate or rectangular, with much-enlarged apex, which is blackish-brown, 20 to 25 *u* wide and 23 to 30 *u* long. Upon *Goodenia geniculata*, Tanunda ; October 29, 1887.

Puccinia Malvacearum, *Montague.* Also in V.

Ustilago Tepperi, *Ludwig ;* Bot. Centralblatt, No. 11, 1889. See Trans. Roy. Soc., S. Aust., vol. XII., p. 153.

Uromyces digitatus, *Winter ;* Revue Mycologique, October, 1886. Acervulus solitary, snowy-white, minute, veiled by the finally cleft epiderm, placed in the centre of a black rotund or orbicular, determinate macula, bounded by a very narrow fuscous line, about ·5 to 1 mm. diameter. Uredospores numerous, ovate or elliptical, golden-brown, densely verrucose, with membrane at the apex sometimes a little thickened, 32 to 35 *u* long and 20 to 25 *u* thick, supported by a hyaline very fragile stipe. Teleutospores cuneate-oblong, on a long persistent hyaline stipe, attenuate at the apex, very much thickened, and bearing three to six digitiform erect or divaricate, often recurved, obtuse processes, at first golden, at length through pale to hyaline, 50 to 60 *u* long and 14 to 18 *u* thick. On living leaves of *Acacia notabilis*, near Gawler, July 1885.

Urocystis Muelleriana, *Thun.* On *Juncus* sp.

Phragmidium Barnardi, *Plowr. & Wint.* ; Revue Mycylogique, Oct., 1886, p. 2 ; on the leaves of *Rubus parvifolius.*

Dimerosporium Ludwigianum, *Sacc.* Hedwigia XXVIII., p. 127. Mycelial maculæ amphigenous, dilutely fuliginous, scarcely determinate, appressed ; perithelia here and there crowded, globular, astomous, superficial, 75 *u* diameter, opaquely fuliginous ; hyphæ radiating, concolorous, septulate, unequal, laxly interwoven, appressed, girt at the base ; asci broadly elevate-fusiform, somewhat obtuse at the apices, very shortly stipitate, 25 to 28 x 9 to 10 *u*, spuriously paraphysate, octosporous ; sporidia distichous shortly fusiform, uniseptate, not constricted, 10 to 12 x 3 *u*, hyaline. On wilted leaves of *Lagenophora Billardieri*, Mount Lofty. Allied to *D. venturioides*, Sacca. and Berla, from which it differs by the appressed hyphæ, by the black contexture of the perithecium, by the perfectly hyaline sporidia, &c.

Nummularia pusilla, *Sacc.*; Hedwigia, XXVIII., p. 127. Stromata very small for the genus, strictly applanate, blackish, elliptical oblong or sinuous, 2 mm.-diameter, or 4 to 5 by 2 mm., scarcely ·5 mm.-thick, soon becoming superficial by the seceding periderm; everywhere fertile, blackish, somewhat shining, with a rectangular margin, the periphery vertical; disk smooth; ostioles punctiform, somewhat crowded, with the small not prominent margin visible only under a lense; perithecia parallelly crowded together, roundly oblong, often unequal, $\frac{1}{3}$ mm. high and $\frac{1}{6}$ mm. thick; asci cylindrical (soon nearly absorbed); sporidia 8, broadly fusiform, rather straight, somewhat pointed at each end, 18 to 22 by 6 *u* in diameter, variously guttate, fuliginous. On dead branches of *Bursaria spinosa*, at Callington. It seems to be allied to *N. cyclisea*, Mont., Syll. Pyr., I., p. 370, to *N. microsticta*, Mont., Syll. Pyr., I., p. 371, to *N. scutata*,, B. & C., Syll. Addit., p. 57, and to *Hypox. stigmoides*: but well distinguished by the form and small size of the non-pruinose stromata, by the largish non-caudate sporidia, &c.

Septoria Bromi, *Sacc.*, Syll. Sphaeropt, p. 562. Perithecia, 150 *u* broad, widely perforate; sporules tortuous, continuous 40 to 50 by 1 to 1·5 *u*. Differs from *S. Koeleriæ* by the perithecia three times larger, the spots obsolete. On the sheaths and leaves of grasses at Murray Bridge.

Pleurotus chætophyllus, *Sacc.*, Hedwigia, XXVIII., p. 125. Dimidiate, obovate-spathulate, thin, very shortly stipitate, with acute at length rather straight margin, densely shortly white-tomentose; stipe rather thick, rugulose; lamellæ narrow, very crowded, generally entire, colour from white to tan, reaching the stipe, everywhere roughened (under a lense) with small fusiform (cystid) subochraceous setulæ, 30 to 40 by 12 to 15 *u*; spores elliptic-reniform, hyaline, 5 by 3 *u*, smooth. On branches in South Australia. Pileus with stipe, 15 to 20 mm. long, 12 to 14 mm. wide, stipe 3 mm. thick. The cuticle under the hair blackens in drying. Allied to *P. limpidioides*, Karst., *Sacc.*, Syll. V., p. 365, but the lamellæ are setulose, not conjoined, everywhere narrow, spores reniform, &c.

Polystictus sanguineus *(L.)*, *Fr.* On trunks of trees, Tandappa, near Lake Eyre.

Polystictus cinnamomeus (*Farq.*), *Sacc.* On the base of the trunks of *Eucalyptus obliqua*.

The diagnoses of the following species are published in Bull. de la Soc. Myc. de France, 1890:—

Ceriomyces incomptus, *Sacc.*; a metagenic form of some *Polyporus*.

Lycoperdon novistoides, *Sacc.*

Tylostoma pulchellum, *Sacc.*

Polystigma Australiense, *Sacc.*; on Leguminosæ.

Poria mollusca, *Fr.*

Polyporus eucalyptorum, *Fr.*; an abnormal flask-shaped form. Also W.A.

Xylopodium australe, *Berk.*; S.A., V., N.S.W.

Polystictus lilacino-gilvus, *Berk.*; P. parvulus, *Kl.*; P. cladonia, *Berk.*

Fomes fulvus, *Fr.*, var.

Naucora conspersa, var.

Didymella cladophila *(Niessl)*, *Sacc.*, and Chætomella brachyspora, *Sacc.*, growing on vine twigs.

Revision of the Thelephoreæ (Order Hymenomycetes). By Masse, Journ. Lin. Soc., vol. XXV., 1889-90. Includes some additional species, and some new to science, for South Australia.

New Species of Flowering Plants inhabiting Extra-Tropical South Australia.

Micrantheum demissum, *F. v. Mueller*, Victorian Naturalist, Sept., 1890 (*M. hexandrum* of South Australian lists, but not of J. Hooker).

Bassia Luehmanni, *F. v. M.*, op. cit., Aug., 1890.

Bassia Tatei, *id.*, Sept., 1890.

Helipterum Fitzgibboni, *id.*, June, 1890.

Helipterum Jesseni, *id.*, Aug, 1890.

Helipterum Trœdeli, *id.*, Oct., 1890.

Eremophila Battii, *F. v. M.*, Proc. Lin. Soc., N.S.W., June, 1890.

Eucalyptus Lansdowneana, *F. v. Mueller* and *J. E. Brown*, in "Forest Flora of S. Aust.," part 9, 1890.

Record of Undescribed Plants from Arnheim-Land, *F. von Mueller*, in Proc. Roy. Soc., N.S. Wales, July, 1890.

Dunbaria singuliflora, *n. sp.*; Clerodendron Holtzei, *n. sp.*; Utricularia Wallichiana, *Wight*; U. Singeriana, *n. sp.*; Aneilema vaginatum, *R. Brown*; Sida Holtzei, *n. sp.*; Tylophora Leibiana, *n. sp.*; Hoya australis, *R. Brown*; Habenaria Holtzei, *n. sp.*

Additions to the Insect-fauna of South Australia will be found recorded in the following papers :—

a. New Species of Saw-flies. By W. W. Froggatt, Proc. Lin. Soc., N.S.W., Sept., 1890.

b. New Species of South Australian Coleoptera. By T. Blackburn, Proc. Lin. Soc., N.S.W. ; Feb., June, and Sept., 1890.

c. Revision of the Genus Heteronyx. By T. Blackburn, *op cit*, Feb. and April, 1890.

d. New Species of Diptera (Nematocera). By F. A. A. Skuse, Proc. Lin. Soc., N.S.W., Sept., 1890.

e. Revision of the Australian Lepidoptera (Hepialidæ and Monocteniadæ). By E. Meyrick, Proc. Lin. Soc., N.S.W., April, 1890.

f. New Carabidæ. By T. G. Sloane, Proc. Lin. Soc., N.S.W., April, 1890.

Older Tertiary Gastropods of Australia.

Parts I. and II. of the above, by Prof. Tate, in Trans. of this Society, vols. X. and XI., are reviewed by M. Cossmann in "L'Annuaire Geologique Universel," vol. V., 1889, pp. 1088-1091.

The reviewer remarks that the fauna has an incontestable analogy with that of the Paris Basin, and advises more frequent comparisons with the European species and with those of the Alabama basin ; and adds that if the Australian fauna does not contain species in common with these, yet it occupies at least a sort of middle place between them which are so widely separated geographically. M. Cossmann's criticisms on the affinities of some species to those of the Paris basin and on their generic location having a high value, are here repeated :—

Typhis laciniatus is comparable with *T. tubifer*, Sow., though the varices are more festooned. *Murex rhysus* has some analogy with *M. bispinosus*, Sow. ; and *M. calvus* has a slight resemblance to *M. tricarinatus*, Lamk. *Murex (Chicoreus) Hamiltonensis* and *M. irregularis* having an absolutely different ornamentation cannot belong to the same group. *Murex (Phyllonotus) Eyrei* and *M. sublævis* much resemble the Parisian *Muricidea*, notably to *M. Steuri*, Cossman. In *Ocinebra* are some *Muricidea*, as *M. biconicus*, which has some analogy with *M. Bernayi*, Desh., or some *Muricopsis* as *M. alveolatus* and *M. crassliratus*, which resemble *M. Auversiensis*, Cossmann. Of *Trophon*, only *T. icosiphyllus* makes an approach to the characters of the genus, the others appear to belong to *Muricidea* or *Muricopsis*. Of the *Tritons*, the first 15 (except *T. ovoideus*, which resembles our *Simpulum planicostatum)* are of very typical species and very distinct from those of the Paris basin. *Epidromus tenuicostatus*

seems closely allied to *Triton turriculatus*, Desh., but *E. citharellus* is absolutely identical with *Plesiotriton volutella*, Lamarck (*Cancellaria*).

Of the large family Fusidæ, we find in Mr. Tate's work a first tentative reform of the genus Fusus, in which the older authors, and especially Deshayes, have classed the most heterogeneous species; *F. incompositus*, *F. bulbodes*, and *F. Tateanus* are Clavellæ recognisable by their pullus and ornamentation; *F. tholoides* and *F. Aldingensis* should constitute a new subgenus, without analogy in the Paris basin, characterised by the tectiform and costulated pullus; the form and ornamentation of *F. aciformis* and *F. hexagonalis* recall very much those of *F. funiculosus*, Lamarck, which is the type of our new genus Latirofusus, it is probable that *F. aciformis* is a synonym of the Parisian species.

Siphonalia spatiosa has analogy with *S. Mariæ*, Mellev., though the canal is not so much curved; *Sipho styliformis* and *S. asperulus* appear to be doubtfully classed.

The seven species of Fasciolaria are very characteristic, but have no analogies in the Paris-Basin. Some of the species of Peristernia should belong to Latirus; *P. actinostephes*, which resembles *F. subaffinis*, D'Orb., belongs to our new subgenus *Latirulus*.

The five species of Pisania consists of a Latirus (*P. purpuroides*), a Euthria (*P. rostrata*), and three of Tritonidea.

Voluta sarissa is extremely allied to *V. angustata*, Desh., *V. lirata* somewhat recalls *V. Fredrici*, Bayan, and *V. crassilabrum* has some analogy with *Septoscapha variculosa*, Lamk., sp. *Mitra Dennanti* is irreconcilable with the typical species; *M. alokiza* is allied to *M. cupressina*; *M. complanata* and *M. ligata* have a resemblance to *M. mixta*; among the species of Costellaria are some which it is impossible to separate from Fusimitra, Conrad, such as *M. leptalea*, *M. paucicostata*, *M. terebræformis*, whilst *M. subcrenularis* is very allied to *M. tetraptycta*.

Ancillaria orycta recalls completely *Amalda excavata*, Cossmann. *Harpa tenuis* may be compared with *Eocithara mutica*.

Of the Cancellariæ, the following find places in some of the subgenera recently established by M. Jousseaume :— *C. Wannonensis* is typical, *C. calculata* and *C. laticostata* to Bivetopsis; *C. gradata* and *C. ptychotropis* to Bivetia; *C. epidromiformis* and *C. exaltata* to Sueltia; *C. modestina* to Merica; *C. turriculata*, *C. Etheridgei*, *C. caperata*, *C. capillata*, *C. micra* and perhaps *C. semicostata* to Narona.

The Terebræ are for the most part related to those of our supra-tertiary beds, not one of them resembles *T. plicatula*, Lamk., the only-known species in the Paris-Basin.

Cassis exigua is allied to *C. textiliosa*.

ABSTRACT OF PROCEEDINGS

OF THE

Royal Society of South Australia,

FOR 1889-90.

ORDINARY MEETING, NOVEMBER 5, 1889.

Dr. STIRLING in the chair.

EXHIBITS.—J. G. O. TEPPER, F.L.S., exhibited from Central Australia, *(a)* the fruit of a *Grevillea* tree, said to be that of the "blood-wood tree;" *(b)* a black substance from the floors of certain caves, supposed to be excremantitious matter; *(c)* a piece of white, light substance, from a quarry near Mount Sonder, which had much the appearance of a stearate of lime; *(d)* piece of quartz-crystals and hæmatite from Mount Sonder; *(e)* specimens of honey ants; *(f)* nest and tunnels of certain ants apparently made in the resinous exudations of a species of *Triodia*, together with sample of surrounding sand.

G. GOYDER, Jun., exhibited from Mount Ogilvie specimens of *Gersdorfitte*, or arsenical nickel ore; *Annabergite*, the same oxidised; *Smaltite*, or arsenical cobalt ore; and from near Blinman, *Erythrite*, or arsenical cobalt ore oxidised, and a specimen of *Graphite* and *Sulphur*.

A. ZIETZ exhibited a collection of native weapons from Cooper's Creek, showing elaborate carving; also portions of a skull of an extinct marsupial, *Thylacoleo*, or Australian pouched lion, which had been found in excavating a dam at Yam Creek, Bundaree, embedded in red clay and associated with the bones of a *Diprotodon* and a yet not identified species of kangaroo. The bones of the *Diprotodon* were as follows:—Base and anterior portion of one skull, two scapulæ, half of a pelvis, a number of vertebræ, of which one, the atlas, was very well preserved, and portions of ribs. All the above fragments apparently belonged to one animal.

PAPERS.—"Soaring of the Hawk," by T. W. KIRK, F.R.M.S.; "Additional List of S.A. Polyzoa," by Dr. MCGILLIVRAY, Corresponding Member.

D. B. ADAMSON stated that he had observed no alteration in the shape and position of the craters of the moon.

Ordinary Meeting, December 3, 1889.

Dr. Stirling in the chair.

Ballot.—Jas. H. Loughhead was elected a Fellow.

Exhibits.—Professor Tate, F.G.S., exhibited coniferous wood, showing woody structure, from the Cretaceous deposits at Boorthanna, in the Lake Eyre basin, forwarded by W. Baggaley, C.E., the Resident Engineer of the Great Northern Railway extension works. The microscopical preparations revealed very distinct large glands in a single series, as in recent species of *Pinus*.

Dr. Stirling showed the skull of a native, presenting a marked resemblance to the celebrated Neanderthal skull, and presenting a very ape-like appearance.

Papers.—"Description of a New Eucalypt," by Baron F. von Mueller and J. E. Brown, Conservator of Forests; "Fossil Corals of the Cambrian Epoch," by R. Etheridge; "Whales and Dolphins of the S.A. Coast," by A. Zietz; "Flora and Geology of Southern Yorke's Peninsula," by Professor Tate, F.G.S.; "Descriptions of Australian Lepidoptera," by E. Meyrick.

Ordinary Meeting, March 4, 1890.

Walter Howchin, F.G.S., in the chair.

Resignation.—The resignation of W. B. Poole as a member of the Council owing to his leaving the province to visit Europe was accepted with regret, and a hearty vote of thanks was passed to him for his services in the interests of the Society.

Election.—Professor Bragg was nominated to fill the vacancy in the Council, and was unanimously elected.

Exhibits.—J. G. O. Tepper, F.L.S., exhibited a fruit from Roebuck Bay, W.A., supposed to belong to a species of *Adansonia*, the kernel of which is eaten by the natives; also the fruits of *Richardia Æthiopica*. He referred to the fruiting of *Yucca aloeifolia* at Roseworthy Farm as showing the existence of some special insect as the direct instrument of fertilization.

J. E. Brown exhibited flowering branchlets and fruits of a new Eucalypt *(E. Lansdowneana)* from Gawler Ranges.

Papers.—"On the Fluorescence of *Bursaria spinosa*," by Professor Rennie; "Notes on Extinct Australian Mammals," by A. Zietz; "Notes on a Parasite of *Entometa ignobilis*," by J. G. O. Tepper, F.L.S.; "Notes on the Life History of *Antheræa Helenæ*," by J. G. O. Tepper, F.L.S.; "List of Australian Fungi," by Dr. Ludwig.

Ordinary Meeting, April 1, 1890.

Dr. Stirling in the chair.

Ballot.—Gregory Board, metallurgist to the Dry Creek Smelting Works, was elected a Fellow.

Exhibits.—J. G. O. Tepper, F.L.S., showed some aggregations of sand which had the outward appearance of potatoes, found amongst the roots of sedges at the Murray Bridge. It was suggested by Professor Tate that they might be casts of the fungus, *Mellita australis*.

Professor Tate, F.G.S., exhibited a specimen of the Belemnitoid genus of *Spirulirostra*, from the Old Tertiary beds at Spring Creek, near Geelong, Victoria. The genus has hitherto been known only by a single species from the Turin tertiaries. The species exhibited was distinct from that.

Papers.—"Notes on Symptoms of Poisoning in Sheep by *Euphorbia eremophila*," by H. Sutherland; "Notes on Plants from Roebuck Bay, W.A., by J. G. O. Tepper, F.L.S.; "Report on Plants from Central Australia, collected by W. T. Tietkins, F.R.G.S.," by Baron F. von Muller and Professor Tate, F.G.S.

Ordinary Meeting, May 6, 1890.

Dr. Stirling in the chair.

Ballot.—Rev. William Gray, New Hebrides, was elected a Fellow; Robert Etheridge, Palæontologist, Australian Museum, Sydney, was elected an Hon. Fellow.

Exhibits.—J. G. O. Tepper, F.L.S., exhibited specimens of entomology, namely *Antheræa Helenæ;* a parasite fly, *Trachinidæ*, on *Entometa ignobilis*, with its proper case, causing the premature death of the latter; specimens of *Chærocampa scrofa*, male and female, chrysalis case and larva. The larva was forwarded from Innamincka by W. Lamb. This moth is becoming much scarcer. Also *Chærocampa celeris*, male and female, chrysalis and larva, probably introduced with vines from France, on the leaves of which the larva feeds. It is becoming commoner, being reported by W. H. Cavenagh and F. Bevilaqua of Tanunda. The chrysalis stage is from ten to sixteen days in summer, but much longer in winter. Also specimens of *Chærocampa roseo-maculata*, previously only known from New South Wales, but now reported as common about Adelaide, and by W. Lamb at Innamincka, feeding on *Convolvulus erubescens* and *C. sepium;* also another *Chærocampa* species, probably new, from Silverton, reported by F. A. Fiveash, and from Oladdie, by H. McGregor, male and female, chrysalis and larva, the latter from Innamincka (W. Lamb),

passed into chrysalis stage February 13, 1889, whence the imago emerged February 25 of same year.

W. Howchin, F.G.S., exhibited a number of water-worn pebbles from a thick bed of conglomerate in the Barossa Range, three miles east of Williamstown, included in highly altered mica and hornblende schists and feldspathic grits, tilted to an angle of 75°; the beds are several hundred feet thick and the pebbles are mainly quartz and feldspathic grit; the pebbles possessing an argillaceous constituent were affected by the metamorphic action in a similar way to the argillaceous matrix.

Rev. Thos. Blackburn, B.A., showed specimens of Pele's hair and volcanic products collected by him from the crater of Kilauea, Hawaii.

Papers.—"Additions to S.A. Coleoptera," by Rev. Thos. Blackburn, B.A.; "Fossil Remains of Australian Mammals," by A. Zietz.

Ordinary Meeting, June 3, 1890.

Dr. Stirling in the chair.

Paper.—"Cremation," by Dr. Wylde.

Motion.—After a discussion, the following motion was carried:—"That the Society is strongly of the opinion that the present mode of disposal of the dead by earth burial is fraught with danger to the health of the community, and it recommends that cremation be permitted by law."

Ordinary Meeting, July 1, 1890.

Dr. Stirling in the chair.

Ballot.—Capt. Anstruther Thompson was elected a Fellow.

Motion.—It was proposed by Prof. Tate, F.G.S., and seconded by S. Dixon—"That the Society desires to draw the attention of the Royal Society of New South Wales to the vast economic and scientific advantages to Australia by a Geological Surveyor being stationed at Broken Hill; and respectfully request that that Society will bring the subject under the consideration of the New South Wales Government."

The motion was carried with the proviso that Professors Tate and Rennie prepare a draft letter to the above effect.

Exhibits.—W. Howchin, F.G.S., exhibited the skulls of two aboriginals. One of these was a well-preserved skull of a woman of the extinct Adelaide tribe, the remains having been exhumed from the sandhills near Plympton. The skull showed a deep indentation in front, as though from a blow by a waddy. As the remainder of the skeleton was said to have been marked by

syphilis, the date of death would probably be within the past 50 years. The second skull was from Meningie. It was of the dolichocephalic type, with the frontal angle very low, the orbital ridges very thick and prominent, and the calvarium had attained the thickness of fully an inch in places. The skull was presented to the museum by the exhibitor. A. W. Fletcher, B.Sc., exhibited Cambrian fossils from Ardrossan and Curramulka, Yorke Peninsula. From Ardrossan there were of the trilobita the genus *Dolichometopus :* and of the order pteropoda the genera *Hyolithes* and *Stenotheca.* From Curramulka various trilobitæ, and an invaginated *Hyolithes.* Calcite, gypsum, fluorspar, copper- and iron-pyrites were found as accessory minerals with the limestone. Prof. Tate spoke of the interest attached to the specimens, and stated that the finding of the fossiliferous limestone at Curramulka rendered it probable that there was a bar of Archæan rock extending across Yorke Peninsula from Ardrossan to Port Victoria. The invaginated pteropod, *Salterella* or *Hyolithes*, was strictly Cambrian in its range, and with its associates fixed very definitely the geological horizon of the specimens. The Cambrian limestones of the Flinders Range exhibit relationship with the Ardrossan section in its corals, and the Curramulka section in its trilobites.

J. J. East exhibited a specimen of asbestos obtained by J. L. Johnson from Nackera, and a number of mineralogical specimens from Mount Crawford.

J. G. O. Tepper, F.L.S., exhibited cocoons and moths of the family Arctiidæ, sent from Mount Gambier by W. Weld, who observed them feeding on *Acacia longifolia ;* also the cocoons of *Cossus cinereus*, and a specimen of ichneumon which is parasitic on it. The cocoon had an ovipositor inserted into it, and contained about 50 of the parasites. Also a collection of 80 species of Australian lichens which had been identified by the Rev. F. R. M. Wilson, of Victoria.

Ordinary Meeting, August 5, 1890.

Dr. Stirling in the chair.

Exhibits.—A. Zietz exhibited a specimen of *Glareola grallaria*, a bird new for South Australia, about the size of an English starling, whose general habitat is Central Australia. In 1884 it was for a few months very numerous about Goodwood, and then disappeared altogether. Also a species of petrel, *Puffinus carnipes*, picked up on the Glenelg beach in 1888. According to Dr. Ramsay's list it is only found on the western and south-western coasts. Also a specimen of musk-duck, *Biziura lobata*, from Cooper's Creek, forwarded by W. Lamb ; it was much larger

than the species frequenting the River Murray. Collection of native weapons, namely, a peculiarly-shaped boomerang from Roebuck Bay, W.A., used for killing fish, spear-heads from Western Australia made from telegraph insulators. J. G. O. Tepper, F.L.S., a collection of weevils; Prof. Tate, F.G.S., a collection of shells from the Dry Creek-bore, in illustration of his paper.

Papers.—"Estuarian Foraminifera of the Port Adelaide River," by W. Howchin, F.G.S. "Geological Section of the Dry Creek-bore," by Prof. Tate, F.G.S.

Ordinary Meeting, September 2, 1890.

Dr. Stirling in the chair.

Ballot.—Alfred Watkins Fletcher, B.Sc., was elected a Fellow.

Exhibits.—Dr. Stirling exhibited a specimen of teal of brilliant plumage of rare occurrence, *Anas castanea*. He did not know the locality from which it came, but several members had seen specimens in various parts of the province. The exhibitor did not agree with Mr. Gould in considering that it was only the nuptial dress of the male of the ordinary teal; he was satisfied that it was a distinct species.

A. Zietz showed six specimens of fresh-water fish from Cooper's Creek, forwarded by W. Lamb, of Innamincka; also specimens of *yuntha*, being oval pieces of wood used by the young male aborigines in certain of their ceremonies. Also a painted wooden post sent by Inspector Foelsche from the Northern Territory. It was used to mark the ground for holding a corroboree in honour of the dead.

Motion.—In response to a circular-letter from the Royal Geographical Society, Melbourne, stating that Barons Nordenskjold and Oscar Dickson had offered to subscribe £5,000 towards defraying the expense of an Antarctic Exploring Expedition, provided a similar amount was subscribed in Australia, it was moved by S. Dixon, and seconded by J. G. O. Tepper, F.L.S., and unanimously carried—"That this Society learns with pleasure of the magnificent offer of Barons Nordenskjold and Oscar Dickson to defray half the expense of an expedition to the Antarctic regions. It heartily supports the action of the Australian Antarctic Exploration Committee in appealing to the general public throughout the Australian colonies for subscriptions to supplement the £5,000 already promised."

Paper.—"Some New Fungi," by J. G. O. Tepper, F.L.S.

Annual Meeting, October 7, 1890.

Dr. Stirling in the chair.

Auditor.—D. J. Adcock was proposed and unanimously elected to audit the accounts of the past year.

Exhibits.—Prof. Tate, F.G.S., showed a species of land snail, *Helix ericetorum*, common to and inhabiting open uplands in England, from Southern Yorke Peninsula, where it is found plentifully in life.

W. Howchin, F.G.S., exhibited a cylindrical stone from the eastern flanks of the Mount Lofty Range, that simulated closely the arenaceous casts of the coal measure-plants, particularly lepidodendron.

A. Zietz showed two specimens of a large insectivorous bat, about two feet in diameter, from a cave near Alice Springs, forwarded by Inspector Besley. The genus Megaderma has not been previously observed as occurring in Australia. The largest species hitherto known, *Molossus australis*, is only one foot in diameter. Also, a live specimen of a beautifully marked small poisonous snake, *Vermicilla Bertholdi*, from Central Australia. Also a specimen of *Phyllopteryx eques*, with the ova attached to the belly.

The annual report and balance-sheet of the Society were read and adopted.

The annual reports and balance-sheets of the Field Naturalists' and Microscopical Sections were accepted.

The Council for the ensuing year was elected as follows:—President, Rev. Thomas Blackburn, B.A.; Vice-Presidents, Prof. Tate, F.G.S., and W. Howchin, F.G.S.; Hon. Treasurer, Walter Rutt, C.E.; Hon. Secretary, W. L. Cleland, M.B.; Members of Council, Prof. Bragg, M.A., Prof. Rennie, D.Sc., E. L. Stirling, M.D., H. T. Whittell, M.D., D. B. Adamson, and Samuel Dixon.

The President (Dr. Stirling) then vacated the chair in favour of the President-elect (Rev. Thos. Blackburn, B.A.), and read an address "On Weissman's Theory of Heredity."

It was carried unanimously that the address be printed.

Papers.—"Coleoptera of Australia, Pt. IV.," by Rev. Thos. Blackburn, B.A. "Supplemental Notes of the Flora of Central Australia," by Baron F. v. Mueller. "On the Geological Structure of the Adelaide Plains, with especial reference to the Croydon Bore," by Prof. Tate, F.G.S. "Gasteropods of the Older Tertiary of Australia, Part III.," by Prof. Tate, F.G.S.

ANNUAL REPORT.

The Council has the pleasure of reporting that the work of the Society has been carried on successfully during the past year.

The exhibits have been of a varied and interesting nature, most of them having been lent for the occasion by the S.A. Museum, through the instrumentality of the Hon. Director (Dr. Stirling, President of the Society). Respecting many of them Messrs. Zietz and Tepper supplied interesting remarks. The Council regrets that greater interest is not taken by the public in these exhibits, which are of great scientific value, and in some cases unique. The descriptions which accompany their exhibition also invests them with an interest that is frequently wanting on a mere inspection in the museum cases. The Council feels that these efforts on the part of exhibitors to make the meetings interesting deserve greater appreciation than they have received.

During the past year five Fellows have been elected, and one Corresponding Member transferred to the list of Fellows. The Council has also thought proper to recommend the Society to confer its highest mark of appreciation for scientific labours on Mr. Robert Etheridge, of the Sydney Museum, by creating him an Hon. Fellow. This recommendation has been unanimously endorsed at a monthly meeting.

The Council has the melancholy duty of reporting the death of two of the Hon. Fellows of the Society during the past year, namely, that of Col. Egerton Warburton and the Rev. J. E. Tenison-Woods.

Col. Egerton Warburton was elected an Hon. Fellow in 1858, and had thus been a member of the Society for more than 30 years. He arrived in South Australia in 1855, from India, and was almost immediately appointed Commissioner of Police. His military training and love of adventure led him early to enter upon that field of exploration of the three unknown portions of the province, with which his name will be ever inseparably connected. As early as 1857 he led a party to the arid and rugged regions of the Gawler Ranges, and in 1860 he examined the country around the Head of the Great Australian Bight, and penetrated in various directions from the coast some 60 miles inland. In 1873 he was appointed to the command of an expedition which traversed the country north of Lake Amadeus, eventually reaching the coast of Western Australia, after he and his party had endured great privations. Such were some of the labours of

Col. Egerton Warburton, who, although he never claimed to be a scientific man in the ordinary meaning of the term, yet possessed the qualities that belong to all imbued with the truly scientific spirit, namely, a love for truth and knowledge, enthusiasm in its pursuit, and untiring energy towards its acquisition.

Rev. J. E. Tenison-Woods, F.L.S., F.G.S.—No heavier loss has this year befallen the Scientific Societies of Australasia than the death of this naturalist. Not only was he one of the foremost Australasian naturalists, but to very many of us he was far more as a dear personal friend, a delightful companion, and a skilled adviser. He was born in 1832, was ordained in the Catholic faith in 1856, and spent a few years in charge of a pastoral diocese in the south-east of this colony. Since then his ministerial duties led him to Tasmania and New South Wales. In 1883, he visited Singapore and the Malay Peninsula, and subsequently passed through the Phillipines, Java, Borneo, and the Northern Territory of South Australia, returning to Sydney in 1886; but during that expedition he contracted a malarial disease, which terminated fatally towards the end of last year. Though at all times a scientific enthusiast, he was nevertheless the devoted priest, and as a preacher he was acknowledged to be singularly earnest and powerful—his fine presence and elocutionary power intensifying his influence. As a scientist his life became a part of the scientific progress and history of Australasia, labouring with equally good results in Geology, Botany, Palæontology and Zoology. He was honoured by all the leading Scientific Societies of Australasia; and at an early period of his scientific career became a Fellow of the Geological and Linnean Societies of London. He was awarded the Clarke-Medal of the Royal Society of New South Wales, and gained one of the same Society's medal for his remarkable paper on the presence of visual organs in the test of certain Mollusca. His early scientific work was the outcome of his residence in the South-East; and his pioneer geological work is in the form of an octavo volume, published in 1862, entitled "Geological Observations in South Australia." In 1865 and 1866, he communicated four papers to the Adelaide Philosophical Society on the Geology and Palæontology of the Tertiary Rocks of South Australia. He lent valuable aid to this Society at a critical period of its career by infusing a higher scientific character to its proceedings; four papers adorned the pages of the first three volumes of its Transactions. In 1877, this Society elected him an Honorary Fellow. He is botanically commemorated by *Styphelia Woodsii*, F. v. Mueller, zoologically by *Thalotia Woodsiana*, Angas, palæontologically by *Echinus Woodsii*, Laube, *Palæoseris Woodsii*, Duncan, *Triton Woodsii*, *Marginella Woodsii*, *Cylichna Woodsii*, *Leda Woodsii*, *Terebratella Woodsii*, and

Magasella Woodsiana, Tate. As a small tribute of respect to one who has done much for the good of religion and laboured so vigorously for the science he loved, and also for the community in general, in whose interest he sacrificed his valuable life, a Memorial Tombstone has been erected over his grave by public subscription.—R.T.

These are the only deaths the Council has to report; but there have been several resignations of Fellows from varying causes. The membership of the Society consists at the present time of 10 Hon. Fellows, 98 Fellows, 14 Corresponding Members, and 1 Associate. Your Council is of opinion that this membership should be larger than it is, for it is assured that there are many who take an interest in scientific matters scattered throughout the country districts. If all with these tastes would but identify themselves with the Society and endeavour to contribute to its work, a great impetus would be given to the acquisition and diffusion of scientific knowledge. A useful body of workers would also in the course of time be formed, and of these some might be expected to aid in the investigation of the many interesting problems of natural science which still await solution in Australasia.

The Field Naturalists and Microscopical Sections continue to thrive, and their annual reports and balance-sheets are appended herewith. Special notice may again be directed to the Supplementary Report of the Field Naturalists' Section on the Native Flora and Fauna, and to emphasise the necessity of the continued strenuous efforts of the scientific public to strengthen the hands of those who during the past year have achieved something, but who are yet far from having, even approximately, gained all that is necessary to be obtained. The Sub-Committee is to be congratulated on the past success of its efforts, as the Council is aware of the difficulty with which it is had to contend.

Your Council views with satisfaction the healthy growth and progress of the Boys' Field Club and the Natural Science Classes of the School of Mines. It feels that from these there will be in time strong reinforcements to the ranks of scientific workers.

The Library of the Society continues to be enriched by a large number of valuable scientific periodicals and monographs, but your Council is far from satisfied with the present conditions under which the books have to be kept. It had hoped that by this time arrangements might have been made to have had them so placed in some portion of the Public Library that members could have had access to them at any time during the day. The Council feels that the present unsatisfactory condition cannot be allowed to continue, but that every effort must be made to place at the disposal of the Fellows the Library in a more efficient way. The earnest attention of the Council, you are about to elect,

should be directed to this point. Two new exchanges have been added to the list, namely, the Geological Society of Stockholm, and the American Philosophical Society of Philadelphia.

This Council has the further satisfaction of reporting that the work of the Society continues to maintain its previous high character; and that it has authorised the expenditure of £60 to illustrate Dr. Stirling's description of the new marsupial, which has been named by him, *Psammoryctes typhlops;* and £33 for plates to illustrate a further contribution to the gastropods of the Older Tertiaries of Australia, by Prof. Tate. The Council would direct the attention of the public to the heavy expenditure which the publication of original matter necessitates, and would suggest that the funds be increased by all joining the Society who are interested in science.

During the past year the following motions of general or public interest have been passed by the members at the ordinary meetings:—

1. That the present method of disposal of the dead by earth burial is fraught with danger to the health of the community, and that it recommends that cremation be permitted by law.

2. Expressing an opinion that the Royal Society of N.S.W. should memorialise its Government as to the vast economic and scientific advantages to Australia of stationing a Geological Surveyor at Broken Hill.

3. That the Society heartily supports the action of the Australian Antarctic Expedition Committee in appealing to the general public of Australia for subscriptions to supplement the £5,000 promised by Barons A. E. Nordenskjold and Oscar Dickson.

During the year a vacancy occurred in this Council owing to the resignation of Mr. W. B. Poole, who desired to visit Europe. This was filled by the election unanimously of Prof. Bragg at the following monthly meeting.

The statement of receipts and expenditure by the Hon. Treasurer (W. Rutt, Esq., C.E.), will show that the finances of the Society stand upon a sound basis.

THE TREASURER IN ACCOUNT WITH THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Dr.	£ s. d.	£ s. d.	Cr.	£ s. d.	£ s. d.
October 1st, 1889.			By Cost of Transactions—		
To Balance brought forward		293 19 3	Printing and Binding (1½ vols.)	97 0 0	
" Subscriptions—			Illustrating	22 10 0	
Royal Society	80 16 0		Editing and Publishing (1½ vols.)	6 19 7	
Field Naturalists' Section ...	20 0 0				126 9 7
Microscopical Section	8 10 0		" Wages—		
		109 6 0	Caretaker and Occasional Assistance		1 19 6
" Government Subsidy		97 18 6	Printing, Postage, and Stationery		10 10 10
" Interest...		9 8 2	Advertising		4 14 7
			Library—Freight, &c. of Books		0 10 9
			Field Naturalists' Section—Grant		25 0 0
			Microscopical Section—Grant ...		8 10 0
			" Balance—		
			Bank of South Australia ...	88 13 10	
			Savings Bank	244 2 10	
					332 16 8
		£510 11 11			£510 11 11

Audited and found correct,
D. J. ADCOCK, Auditor.
October 6th, 1890.

WALTER RUTT, Treasurer.
October 1st, 1890.

PRESIDENTIAL ADDRESS

To the Royal Society of South Australia, October 7, 1890.

WEISMANN'S THEORY OF HEREDITY.

No country in the world offers biological problems of more entrancing interest than Australia, and it is often a source of regret to me that the too-exacting requirements of a teaching appointment, coupled with many duties both public and private, are an effectual hindrance to the prosecution of some original lines of research peculiarly Australian, any one of which might have been appropriately made the subject of an address to this Society. But as circumstances have rendered that impossible, I must fall back upon the humbler *rôle* of an interpreter of other men's thoughts, and therefore I purpose this evening to present to you, in terms that I trust will be comprehensible even to those who have had no special training in the subject, an exposition of some recent biological theories that are exciting a good deal of interest and discussion amongst the foremost investigators and physiologists of the day. And indeed, the interest excited has not been confined to the still narrow limits of the Scientific world, but it has extended to the general educated public.

The problems of heredity on which I intend to speak are not new. They were under discussion as far back as the time of Aristotle, but in our own days they have assumed a special prominence and importance not only from their fundamental relation to the Darwinian theory of evolution, but also from their association with the question of the transmission of disease and deformity, on which subject at last some light is beginning to be shed.

I must, however, disclaim any intention of laying before you all the various theories that have been offered of late years in explanation of the facts of heredity; my aim is rather to set before you without argument or comment the salient points of an elaborate and luminous theory that has recently been put forward by a distinguished German physiologist and philosopher, whose views, in spite of many objections, have met with a very general and favourable acceptance by biologists. And, whether or not they receive entire concurrence, there can be little doubt but that the theory of Professor Weismann, by reason of its extended scope and logical completeness, serves as the best working hypothesis yet extant for future investigations on the subject.

One may say this, and at the same time freely acknowledge that, in some respects, the views of Weismann have been distinctly foreshadowed or overlapped by the statements of other biologists. No one, however, has offered a theory so compact or so logically complete in all its parts.

A fresh interest in Weismann's theories, now some few years old, has been recently kindled by the publication of an English translation of his writings by the Clarendon press; but as his elaborate system of biological philosophy is there presented in a series of disconnected essays, it is a matter of considerable difficulty, for those unfamiliar with biological methods of reasoning and research, to gather up the thread of his argument which runs through the whole series of separate articles. This being so, I conceive that I may be of some service in offering to this Society an epitome of the chief theories which comprise his system, in such a form as to make its comprehension as easy as is possible in a subject naturally full of difficulties. And I will take this opportunity of acknowledging the great assistance I have received in this task from the writings of Romanes, Shipley, Sir William Turner, McKendrick, Vines, and others who have appeared either as the advocates, opponents or interpreters of the views of Professor Weismann. From these I have freely borrowed.

Recent researches, especially amongst the Invertebrata, have made it abundantly clear that the young animal arises by the fusion, within the egg- or germ-cell, of an extremely minute particle derived from the sperm-cell produced by the male-parent with an almost equally minute particle derived from the germ-cell itself the product of the female-parent. These particles are termed the male- and female-pronucleus respectively, and the resulting body formed by their fusion the segmentation-nucleus, which, though exceedingly minute, is also exceedingly complex both in its chemical and molecular constitution.

From this segmentation-nucleus and from the surrounding protoplasm of the egg-cell other cells arise by a process of subdivision, and these at length become arranged in definite layers, called the germinal layers, from which all the tissues and organs of the body are gradually formed in orderly sequence. It is the segmentation-nucleus which thus forms the starting point of all the subsequent complicated changes; and inasmuch as this is formed by the fusion of particles of material from both parents we start with the fact of a physical continuity between parent and offspring, and are thus enabled to lay down are fundamental proposition that a physical basis for heredity exists.

One result of this physical continuity of substance is that the offspring resembles the parents not only in bodily form and

feature, but also in mind and temperament, and in that *damnosa hæreditas* liability to particular diseases.

So far we are dealing with facts with which every physiologist is familiar.

Now, the size of the segmentation-nucleus, which we have seen is formed by the fusion of particles from both parents, is itself exceedingly minute, and further, in the course of division of the egg-cell the substance of this segmentation-nucleus must in the course of its diffusion amongst the continuously-increasing cells of the growing embryonic body, undergo a degree of attenuation far surpassing the extremest idea of homœopathic dilution ; yet the presence of these attenuated particles is sufficient to stamp the offspring with the characters, not only of the immediate parents, but also with those of still remoter ancestors.

It is to be noted also that the power of production of a new individual lies in the special cells called germ- and sperm-cells respectively, which are, so to speak, isolated from the rest of the body and set apart for this special purpose of reproduction. Even at a very early period of growth they are thus marked off from the rest of the embryonic body, taking no part in its growth, but being only dependent on the constituent cells of this for shelter and nutrition. These special cells constitute the essential portions of what are called the reproductive organs.

The central problem of heredity is therefore the discovery of the manner in which these reproductive cells, marked off as they are from the rest of the body, become stamped, as it were, with the potentiality of transmitting to the offspring the multifarious characteristics and peculiarities, not only of the parent organisms but also to a lesser degree those of preceding ancestors ; or as Weismann himself puts the question—"How is it that a single cell can reproduce the *tout ensemble* of the parent with the faithfulness of a portrait?" He proceeds to offer for the solution of this extremely difficult problem his theory of the "Continuity of the Germ-plasm," which, according to his views, rests upon the fact that the reproductive cells are not derived from the general body-cells of the individual in which they occur, but are the direct descendants of the germ-cells of the parent. In other words Weismann represents that the particulate body formed from the fusion of elements from both parents contains a substance which he calls germ-plasm, and this, he states, is not entirely used up in the formation of a given offspring, but a portion is set aside, it may be at an exceedingly early stage of development, and reserved unchanged to form the germ-cells of the next generation. The sharpest distinction is thus to be drawn between two classes of cells composing the body of the developing germ which are destined for entirely different purposes. One set is destined for the

growth of the personal structure of the body, which he terms *somatic* cells; the other for the ultimate perpetuation of the species or *blastogenic* cells which pass on as it were from generation to generation.

Further, it has been shown by previous writers that the above-mentioned particulate body or pronucleus arising out of the fusion of elements from both parents, is really formed by the conjugation of the nuclei, or more accurately, of certain parts of the nuclei, of the respective reproductive cells male and female. So it must be that it is the nuclear substance which is the real bearer of hereditary tendencies and much has been written lately as to the intricate structure of the nuclei of active cells. The two nuclei must be supposed not only to carry over germ-plasm from each immediate parent, but also some fraction from every preceding parent, the amount diminishing in geometrical ratio as we proceed backwards in the ancestral line.

This is Weismann's main contention briefly stated, but in order fully to understand his train of reasoning, and to realise the full force of his conclusions, it is necessary to review some other of his facts and arguments which are so intricately bound up with his central theory of heredity as to make the comprehension of them a necessary preliminary to the consideration of the main issue.

Starting from the position that all living organisms, whether plants or animals, consist of one or more cells, we may class them in two great divisions—unicellular and multicellular. The unicellular plants and animals are termed Protophyta and Protozoa, the multicellular Metaphyta and Metazoa respectively, and it is hardly necessary to point out that it is the unicellular plants and animals which exhibit the phenomena of life in the simplest and most elementary forms. Recognising the well-known facts that the unicellular organisms reproduce themselves by fission, that is, by the division of the parent organism into two approximately equal parts, or by the closely analogous process of gemmation, in which a small bud of the parent tissue grows from the body to increase in size and to be subsequently separated into an independent individual, Professor Weismann comes to the somewhat startling conclusion, which seems to have been overlooked by other biologists, that aboriginally life is immortal, and that the conclusion, that death is *necessarily* the end of all living things, must be abandoned. For, when a simple unicellular organism, such as the Amœba, reproduces its kind, it does so by this process of fission or division into two equal parts, each half growing into a Protozoon resembling its parent, and thus the actual and identical protoplasm of the parent Amœba lives on, as it were, in the bodies of its descendants, each one of which con-

tains a fraction of the parental living substance. As this process of division has gone on from generation to generation it is clear that the protoplasm of the ancestral and primeval Amœba has lived on ever since Amœba-like organisms made their appearance. The Protozoa then, as also the Protophyta, are endowed with the potentiality of eternal life. This does not of course imply that they cannot die, or that they do not die, but merely that, if they be shielded from fatal accidents, they do not die a natural death, but live on, increasing in size up to a certain limit, and when that limit is reached dividing into two or more similar organisms. And we may go as far as to say that every Protozoon of the present day is alive with the actual life of its primeval ancestor, the body of which has thus lived on in the substance of its descendants ever since life itself made its appearance on this planet.

Metazoa and Metaphyta on the other hand do die a natural death. To the higher organisms with which we are most familiar death is undoubtedly the end of all things.

These multicellular beings have undoubtedly descended from unicellular organisms which, we have seen, are endowed with the potentiality of everlasting life, and the former must have developed the power of dying when they ceased to consist of simple cells. The question thus arises why should life, immortal in the case of the unicellular organisms, have ceased to be so in the case of the multicellular?

Weismann's answer is based upon the fact that multicellular organisms do not propagate themselves solely by such a-sexual methods as fission and gemmation, but by a sexual process in which the origin of a new individual depends upon the fusion or conjugation of certain specialised portions of two parents.

It is true that the general body-cells of multicellular organisms can reproduce themselves to a certain degree, as shown in the growth and repair of tissues and organs, or even in certain cases of whole members, but it is only a certain specialised group of these cells which can do so to that unlimited extent which is characteristic of unicellular organisms.

It is to this limitation in respect of the power of division of the somatic- or body-cells that the phenomenon of death is owing.

Thus we return to the cardinal point which is so important. I repeat it at the risk of being tedious, that the cells of the complex Metazoon can be divided into two categories, reproductive cells and body- or somatic-cells, the former inheriting from their ancestors, the Protozoa, their unlimited power of division, the latter possessing this power only to the extent of the attainment of the limit of size of the individual, and when this limit is attained the

organism dies by reason of the impossibility of any further growth of the body.

The reproductive cells are, then, the essential factors for the continuance of the species, the somatic for the growth of the individual.

Now, it is evident, from the point of view of the species in contradistinction to that of the individual, that a change from the asexual to the sexual method of reproduction must carry with it a distinct advantage, for, it must be remembered that the individual exists for the good of the species. The advantage which death possesses for the species appears on consideration of the consequences which would ensue if these complex organisms were endowed with immortality, for in such a case all those members of a species which multiplied by sexual methods would, in the course of time, come to be composed of broken down and decrepid individuals, resulting from the inevitable disease and accidents of life, and they would consequently be less well adapted for their place in nature than younger, healthier, and less-damaged forms.

The doom of death, then, appears to have been brought about by natural selection, inasmuch as it is for the benefit of those species which propagate themselves sexually, that the individual composing them should not live longer than is necessary for the purpose of giving origin to the next generation, and fairly launching its members on their own career of struggle for existence.

Our position, therefore, stands thus at present:—Protoplasm was originally immortal, and unicellular organisms still preserve this attribute of immortality, but in the case of the multicellular organisms which propagate sexually, natural selection has reduced the term of life within the narrowest limits which are compatible with the performance of the sexual act and the subsequent rearing of the progeny up to the period at which they are capable of taking care of themselves.

The reproductive elements of their bodies alone have reserved the attribute of immortality, as the means whereby a continuous stream of life has been maintained from the time of its first appearance until now.

Why, then, should sexual reproduction, which carries with it the doom of death, have become the universal law for all the higher organisms? Looking at its universality, it must be assumed to play an all-important *rôle* in the scheme of organic life. What is the *rôle?* Briefly, according to Weismann, its object is to furnish congenital variations to the ever ready and ever active agency of natural selection, from which the most favourably endowed examples of the species may be preserved, and their

advantageous endowments passed on to the next generation. How this is brought about will appear if we remember that at each sexual union there is a mixture of two reproductive elements, and that each of these is the product of the fusion of two other reproductive elements of the preceding generation. Thus it follows that the germinal elements of no one member of the species can ever be the same as that of any other member; in fact, each such germinal element has had a different ancestral history, and each represents an admixture derived from thousands, and perhaps millions, of individuals in different lines of descent. In the union of any two of these enormously complex but always differing germinal elements we have the cause of innumerable congenital variations—the only variations which Weismann will allow are transmissible by heredity. Though we may thus make a reasonable attempt to explain the *raison d'être* of the process of sexual reproduction, the cause which led to its adoption is a problem which still awaits suggestion and solution.

So far, then, Weismann leads us to the conclusion that the dominion and influence of natural selection can only be made to extend as far back as the Protozoa, over which it is unable to exert any influence at all, for, if natural selection depends for its activity upon the occurrence of congenital variations, and if congenital variations in their turn depend upon the exercise of the exual method of reproduction, it follows that organisms which do not propagate themselves by this method cannot present congenital variations, and cannot thus come under the dominion of natural selection; in other words, while for unicellular organisms Weismann is an exclusive advocate of the views of Lamarck, whose theory, as is well known, was mainly based upon the effect and transmissibility of acquired characters, for the multicellular he is rigidly and entirely his opponent.

Inseparably bound up with the theory of the continuity of the germ plasma is the assumption of the great difference which obtains in respect of the transmissibility of characters which are congenital, and characters which are acquired; and so much importance does Weismann lay upon a sharp and clear distinction being made between these two kinds of characters, that I had best quote the words of his own essay on this part of the subject:—"It is certainly necessary to have two terms which distinguish sharply between the two chief groups of characters—the primary characters which first appear in the body itself, and the secondary ones which owe their appearance to variations in the germ, however such variations may have arisen. We have hitherto been accustomed to call the former 'acquired characters,' but we might also call them *somatogenic*, because they follow from the reaction of the *soma* under external influence, while all other

characters might be contrasted as *blastogenic*, because they include all those characters in the body which have arisen from changes in the germ. In this way we might prevent the possibility of a misunderstanding. We maintain that the *somatogenic* character cannot be transmitted, or rather that those who assert that they can be transmitted must furnish the requisite proofs.

"The *somatogenic* characters not only include the effects of mutilation, but the changes which follow from increased or diminished performance of function, and those which are directly due to nutrition and any of the other external influences which act upon the body.

"Among the *blastogenic* characters we include not only all the changes produced by natural selection operating upon variations in the germ, but all other characters which result from this latter cause."

For example, a man may either be born with some malformation of one of his fingers or he may acquire such malformation or mutilation as the result of accident or disease. Now in the former case, when the malformation is congenital, it is extremely probable that the peculiarity will be transmitted to his children, while in the case where the man has himself acquired the deformity, it is, according to Weismann, certain that there will be no such transmission.

It is quite true that both medical men and biologists have long been aware of the remarkable tendency that exists for the inheritance of congenital deformity, but it has been at the same time generally assumed that acquired characters might also be regarded as similarly hereditable, though with less certainty and to a less extent. The difference thus being considered to be one of degree merely. Weismann makes it one of kind, and states it to be a physiological impossibility that acquired characters, as defined by him, can be transmitted under any circumstances.

He declares that the evidence put forward by other biologists in favour of the opposite view, which he discusses at considerable length in one of his essays, is either unreliable or inconclusive. On this same question much discussion has recently taken place in the pages of *Nature* between some of the most distinguished biologists of the day; indeed, it still continues with unabated vigour.

We are now in a position to resume consideration of Weismann's central theory of heredity, and, recapitulating the substance of what has gone before, we have seen that the body of the multicellular organism is composed of two entirely different kinds of cells—germ-cells and somatic-cells—the former being concerned solely with reproduction and the latter with the build-

ing up of the bodily framework in which the germ-cells find lodgement.

Further, the somatic-cells, aggregated as they are into groups constituting the various tissues and organs of the body, become subject to the action of the environment, through and by which they can be modified in various ways during the life-time of the individual. Modifications resulting from such causes are the acquired, or *somatogenic* characters of Weismann, and according to his view, they can in no case influence the germ-cells and appear in the products of these as congenital or *blastogenic* characters. The germ-cells on the other hand differ *toto cœlo* from the somatic, inasmuch as they are the receptacles of the imperishable germ-plasm, and have no connection with the somatic-cells save that the former are sheltered and nourished by the latter. This germ-plasm took its origin in primeval unicellular organisms, and has been handed down from these through remote ages through them and through all the generations of multicellular organisms which, in the course of evolution, succeeded the unicellular; or putting these abstract propositions more concretely, suppose a new individual to be formed by the union of the germ-plasm of two parent organisms, a portion only of this admixture is used up in the formation of the said individual, a certain residual fraction remains stored up in its reproductive cells to be, in its turn, handed over to a member of the next generation. This successive transference from generation to generation represents that continuity of germ-plasm which is the central feature of Weismann's theory. Again, we must assume that these successive fragments, which are passed on from individual to individual, grow and multiply at the expense of the somatic cells of each individual in which they find lodgement. Whilst thus however growing and multiplying the germ-plasm itself faithfully preserves the chemical and molecular qualities of that primeval fragment which the first sexual parents passed on to their first offspring. To make these statements still clearer let me borrow from Sir William Turner the following graphic mode of expressing the above facts.*

A	B	C	D.
a	*ab*	*abc*	*abcd.*

Let the capital letters, A B C D, express a series of successive generations. Suppose A to be the starting point and to represent the somatic or personal structure of an individual, then *a* may stand for the reproductive cells, or germ-plasm, which the offspring of A, viz., B, is produced.

* The idea would have been better conveyed if the small letters had been included within the capitals.

B, like A, has both a personal structure and reproductive cells, or germ-plasm, the latter of which is represented by the letters *ab*, which are intended to show that while belonging to B they have a line of continuity with A. C stands for an individual of the third generation, in which the reproductive plasm is indicated by *abc*, to express that, though within the body of C the germ-plasm is continuous with that of both *b* and *a*.

D also contains the reproductive cells *abcd*, which are continuous with the germ-plasm of the three preceding generations, and so on ; or for the sake of clearness to put the matter in yet another way as suggested by Dr. Romanes, we might represent the germ-plasm by the metaphor of a yeast-plant, a single particle of which may be put into a vat of nutrient fluid ; there it lives and grows upon the nutriment supplied, so that a new particle may be taken to impregnate another vat, and so on *ad infinitum*. Here the successive vats would represent successive generations of progeny. But to make the metaphor complete one would require to suppose that in each case the yeast-cell was required to begin by making its own vat of nutrient material, and that it was only the residual portion of the cell which was afterwards able to grow and multiply. But though the metaphor is thus necessarily a clumsy one it may serve to emphasise the all-important feature of Weismann's theory, viz., the almost absolute independence of the germ-plasm. For, just as the properties of the yeast-plant would be in no way affected by anything that might happen to the vat, short of its being broken up or having its malt impaired, so, according to Weismann, the properties of the germ-plasm cannot be affected by anything that may happen to its containing *soma*, short of the *soma* being destroyed or having its nutritive functions impaired.

The consideration of this theory would be manifestly incomplete without reference to its *modus operandi* in the origination of new species, and it has already been stated that it requires the assumption that congenital variations only being inheritable no variation impressed upon the organism by the action of its environment—that is, no acquired variation can be in the same way transmitted.

Such acquired variations, however advantageous to the individual, cease with the life of that individual—are intransmisable to succeeding generations, and therefore of no account phylogenetically. Congenital variations alone tell in the process of organic evolution, and, remembering the facts we have stated as to the advantage of sexual reproduction in respect of the production of congenital variations, we can see how the process of natural selection has for its base of operations the innumerable congenital

variations that have occurred in the course of the thousands of years during which sexual reproduction has been in vogue.

Congenital variations are, in fact, dependent on variations of the germ-plasm out of which organisms are built, and this comes to the same thing as saying that natural selection works in and through these variations of the germ-plasm—that is to say, through natural selection. For picking out the individuals that are best adapted to their own environment, it is really picking out the most suitable and advantageous combinations of germ-plasms which, when expanded into the resulting organisms, realise the best opportunities for survival in the struggle for existence through which they have to pass. And, as we have already stated, a certain overplus of this germ-plasm, not being used up in the *somatic* or personal structure of a given organism, is handed over to the keeping of an individual of the next generation, and from this a still smaller fraction proceeds to the next, and so on, preserving all the while its own peculiar characteristics, until in the course of sexual reproduction it meets with another fragment of germ-plasm, which may still further improve its qualities, or the reverse. In the former case the fusion will result in the maturation of an organism still better equipped for the struggle for existence than either parent, and natural selection will seize upon the improvement, and cause it to be perpetuated.

Putting the matter, then, briefly, we may say that natural selection is ever waiting and watching for such fresh and fortuitous combinations of germ-plasm as will produce individuals best calculated for survival, and on the other hand that destruction lies in wait for those combinations which result in organisms less favourably endowed.

A stability on the part of germ-plasm, unchangeable and unalterable except by the modifying influence of other germ-plasma itself equally stable, stands, then, as an essential feature of Weismann's theory. The germ-plasm of any organism being of the same essential nature as when it started on its career thousands of years ago. Like the unicellular organisms, it is endowed with the property of everlasting life; it is immortal.

Such a conclusion, however, inevitably leads to the question, What was the cause of those aboriginal differences of character in the germ-plasmas of different multicellular organisms which first gave rise to congenital variations?

Weismann answers that those differences arose out of the original differences in unicellular organisms which were the ancestors of the multicellular. The former differ from the latter, as we have seen, in that they alone can be influenced by the action their environment and the different species of unicellular organisms arose in consequence of these differences of reaction.

The singular but logical result of this closely-reasoned train of argument is that all congenital variations of multicellular organisms are really and actually the remote consequences of differences stamped upon their primeval unicellular ancestors by variations in their surrounding conditions of life.

Such is an outline of Weismann's theory as put forth in the series of essays alluded to. Many objections have been, and are still being, raised to some of his facts and arguments, and even the author himself has modified some of his views since they were first enunciated. Taken as a whole, these essays constitute a remarkable addition to the literature of evolution, and the conclusions to which they lead have already exercised a profound influence on the current of modern biological thought, and are destined, I think, to bear still further fruits.

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Harrold, A. L.	Adelaide ...	1876
Hay, Hon. A., M.L.C.	Adelaide ...	1861
Henry, A., M.D.	Adelaide ...	1882
*Howchin, W., F.G.S.	Goolwood East ...	1883
Hughes, H. W.	Booyoolie ...	1883
(F) Kay, R.	Adelaide ...	1853
*Lamb, Prof., M.A., F.R.S.	England ...	1883
Laughton, E.	Adelaide ...	1874
Lendon, A. A., M.D.	Adelaide ...	1884
Lloyd, J. S.	Adelaide ...	1856
Loughhead, Jas. H.	Parkside ...	1889
Lower, O. B.	Parkside ...	1888
*Lucas, R. B.	Adelaide ...	1885
Magarey, A. T.	North Adelaide ...	1873
*Magarey, Hon. S. J., M.B.	Adelaide ...	1874
Mayo, Geo., F.R.C.S.	Adelaide ...	1853
Mayo, G. G.	Adelaide ...	1874
Mestayer, R. L., F.R.M.S.	Sydney ...	1883
*Meyrick, E. T., B.A.	England ...	1881
Middleton, W. J. E.	Upper Sturt ...	1882
Mitchell, J. T., M.D.	Port Adelaide ...	1885
Molineux, A.	Kent Town ...	1880
(L) Murray, Hon. David, M.L.C. ...	Adelaide ...	1859
Munton, H. S.	Adelaide ...	1884
*Parker, Thos.	... ...	1883
Phillips, W. H.	Adelaide ...	1883
Phillipson, W. T.	Adelaide ...	1887
Poole, W. B.	Adelaide ...	1886
Robertson, R., F.F.P.S.	Adelaide ...	1882
*Rennie, Prof. E. H., D.Sc., F.C.S. ...	Adelaide ...	1885
Renner, F. E., M.D.	Petersburg ...	1885
Russell, William	Port Adelaide ...	1879

*Rutt, Walter, C.E.	Adelaide ...	1866
Salom, Hon. M., M.L.C.	Adelaide ...	1868
*Schomburgk, R., Ph.D.	Adelaide ...	1865
Scott, Jas. L.	Hyde Park ...	1865
Smeaton, Thos. D....	Littlehampton ...	1857
Smith, R. Barr	Adelaide ...	1871
Smythe, J. T., B.A., B.E.	Glenelg ...	1882
*Stirling, E. C., M.D., F.R.C.S. ...	Adelaide ...	1884
Stuckey, J. J., M.A.	Adelaide ...	1878
*Tate, Prof. R., F.G.S., F.L.S. ...	Adelaide ...	1876
Thomas, J. D., M.D., F.R.C.S. ...	Adelaide ...	1877
Thomson, Capt. Anstruther	Adelaide ...	1890
*Tepper, J. G. O., F.L.S. (Corr. Memb., 1878)	Norwood ...	1885
*Todd, Charles, C.M.G., M.A., F.R.S. ...	Adelaide ...	1856
Tyas, J. W.	Adelaide ...	1882
Umbehaun, C.	Adelaide ...	1879
Vardon, Joseph	Adelaide ...	1889
*Verco, J. C., M.D., F.R.C.S. ...	Adelaide ...	1878
Vickery, G.	Meadows ...	1868
Wainwright, Ed. H., B.Sc.	St. Peters ...	1883
Ware, W. L.	Adelaide ...	1878
Way, E. W., M.B.	Adelaide ...	1879
Way, S. J., Chief Justice	Adelaide ...	1859
Wheeler, F.	Fremantle, W.A....	1884
*Whittell, H., M.D., F.R.M.S. ...	Adelaide ...	1882
Wilson, John, F.E.T.S.	Goodwood ...	1887
*Wragge, C. L., F.R.G.S.	Brisbane ...	1887
*Zietz, A.	Adelaide ...	1886

ASSOCIATE.

Hodgson, Mrs.	Port Victor ...	1884

APPENDIX.

FIELD NATURALISTS' SECTION

OF THE

Royal Society of South Australia.

ANNUAL REPORT.

THE Committee have pleasure in presenting the following report of the work of the Section for the year ending 30th September, 1890, which completes the seventh year of its existence.

Evening Meetings.—During the year eight evening meetings have been held, at which the attendance has on the whole been well maintained. A new departure was made at the commencement of the session, when it was attempted to make these gatherings less formal in character and partake more of the nature of "gossip" meetings. Two short papers have usually been provided for each meeting, and special efforts have been made to secure exhibits. In the latter direction the help of some of our local correspondents has been very useful. As a result of these steps the evening meetings have been more than usually interesting, and the attendance has in most cases shown an improvement on that of recent years. Papers have been contributed by the following gentlemen:—Professor W. H. Bragg, M.A.; Dr. R. H. Perks, M.A., F.R.C.S.; Messrs. T. A. Masey, F.Z.S., J. G. O. Tepper, F.L.S., W. Howchin, F.G.S., and S. Dixon.

Excursions.—There have been ten excursions during the year, at which the attendance has on the whole been satisfactory, reaching as high as over 50. In those cases where the number

has been small the unfavorable weather has generally accounted for it. Amongst the most successful excursions have been those to the Agricultural College at Roseworthy, to Marion, and to the Smelting and Refining Works at Dry Creek. There has also been, as is customary, one sea trip for trawling and dredging. Some localities have been visited for the first time, the scrub between Gawler and Roseworthy being the most noteworthy, as it contained many plants not previously met with on these excursions.

Annual Conversazione.—The first conversazione held in conjunction with the Microscopical Section took place in October last. Notwithstanding the inclement weather it was largely attended, and proved very successful. There was a most interesting collection of objects of natural history as well as of microscopes, and Mr. T. A. Masey, F.Z.S., read a paper on "Aquaria." It is hoped that a joint conversazione of the two sections will be held annually, as a more interesting display can be made by thus amalgamating their forces.

Protection of our Native Fauna and Flora.—A separate report from the Committee appointed for this purpose is presented, from which you will learn that their efforts are being continued with encouraging results. The setting apart of Government Farm as a national reserve, which was one of the chief objects aimed at in appointing this Committee, now seems to have a fair prospect of realization. Your Committee think that there is still room for an extension of these efforts to secure national reserves.

Local Correspondents.—Although some of the persons who undertook to act in this capacity have not shown much practical interest in the work, there are others to whom the Section is indebted in various ways, chiefly for sending natural history specimens. It is intended that those persons who have thus given proof of their desire to help us shall be entered on our list as "Corresponding Members."

Membership.—There have not been so many additions to our roll of membership as last year, but the numerical strength remains about the same, as there have been fewer removals. During the year six persons have joined the Section and ten names have been struck off. The number now on the roll is 108.

Saml. Dixon, Chairman.
W. H. Selway, Jun., Hon. Sec.

Adelaide, 15th September, 1890.

SECOND ANNUAL PROGRESS REPORT OF THE NATIVE FAUNA AND FLORA PROTECTION COMMITTEE.

In presenting their second annual progress Report, the Committee appointed by the Section to seek to secure better protection for the native fauna and flora, have to state that although the progress made during the year has been slow, it has still been to some degree at least certain.

National Parks.—The Public Service Commission in their most recent report recommended that the whole of Government Farm should be set aside as a National Park. The Cockburn Government subsequently agreed to take steps to have this suggestion carried into effect; but their retirement from office prevented them from fulfilling their promise. Lately a large deputation from the City Corporation and other municipal bodies and District Councils within a radius of 20 miles of Adelaide, as well as the Royal Society and this Section, interviewed the present Premier (Hon. T. Playford) on the subject, and he appeared willing to set aside 1,700 acres of the Farm as a public park, reserving 300 acres for working men's blocks. It will be remembered that in October, 1888, Mr. Playford promised to set apart the whole of Government Farm if such were the public wish. The Committee believe that there is a considerable probability of all the 2,000 acres being eventually gained for the object specified. A report has been prepared by the Surveyor-General, which contains suggestions that 540 acres of the Farm, 3,250 acres in the Hundred of Noarlunga (adjoining the River Onkaparinga), and 1,200 acres in the vicinity of Mount Crawford should be set apart for the preservation of indigenous plants and animals. The Committee consider that, for the present, it will be expedient to continue their efforts in order to secure the whole of Government Farm.

Forest Reserves.—The Committee have noticed with the greatest regret that an extremely short-sighted policy has caused a considerable diminution of the forest areas without any compensating extension. They will continue their endeavours to have this condition of affairs remedied, and amongst other things they intend to try to secure the reservation of about 11,000 acres at Mount Crawford as a natural red-gum forest. As a means of gaining the better protection of the native fauna, the Australasian Association will be asked to urge the different colonial Governments to declare all State forests close preserves for harmless animals.

Action in the Other Colonies.—The statesman-like policy pursued

both in New South Wales and Victoria with regard both to forests and national parks stands in marked contrast to the parochial attitude of South Australian Ministers.

Game Laws.—The Commissioner of Crown Lands has again issued placards notifying the provisions of the Game Act, and the Committee have reason to believe that this action has been productive of some good. It has not been considered advisable to seek any alteration of the Game Laws during the present session of Parliament

Promotion of Public Sentiment.—A series of articles on the general question was kindly published by the *Register* in October, 1889, and reprints have been circulated. The Australian Natives' Association and the Wattle-Blossom League have been asked, and have promised to support the movement.

In conclusion, the Committee hope before very long to be able to point to some more definite result from their labours.

Samuel Dixon, Chairman.
A. F. Robin, Hon. Sec.

September 16, 1890.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Receipts and Expenditure for the Year Ending 30th September, 1890.

Dr.

Receipts.	£	s.	d.
To Balance brought forward	3	5	2
" Grant from Royal Society	25	0	0
" Subscriptions	20	0	0
" Microscopical Section's Share of Expenses of Combined Annual Conversazione	0	16	0
	£49	1	2

Cr.

Expenditure.	£	s.	d.
By Postages	6	10	10
" Printing (General)	6	3	0
" Printing (Proceedings)	5	13	6
" Advertising	3	14	0
" Attendance (Caretaker)	1	1	0
" Sundries	0	17	0
	23	19	4
" Subscriptions, as per contra, handed over to Hon. Sec. Royal Society	20	0	0
	43	19	4
" Balance in Hand	5	1	10
	£49	1	2

Audited and found correct,

J. H. C. LANGDON,
THOS. EVANS, } Auditors.

Adelaide, 15th September, 1890.

W. H. SELWAY, Jun., Hon. Sec.

MICROSCOPICAL SECTION

OF THE

Royal Society of South Australia.

ANNUAL REPORT, 1889-90.

The Committee beg to submit the following report on the work of the Section during the last twelve months:—The attendance at the meetings has not been as good as during the previous year, but still we feel that there is no falling off in the interest taken by those who are generally to be found present at the monthly meetings. We have been deprived for most of the session of the presence and help of two of our most energetic officers. Our Chairman has been absent on a visit to Europe, and one of our Vice-Chairmen has been unable to attend through illness. Though deprived of their valuable assistance, we have been able to provide something special for each meeting of the Section, although our numbers being small the work falls rather heavily on a few. During the year we have received a further donation of books from Mr. H. C. Mais, consisting of 12 bound volumes of *Science Gossip*, from 1878 to 1889. Also from Mr. O. Boettger a number of splendid photo-micrographs of various test diatoms taken with Zeiss' apochromatic objectives. Several excursions have been made, but no new places of interest to microscopists have been found.

The number of members at present is 33, the same number as in last report, 4 members having resigned and 4 new members joined during the year. We have also 4 honorary members. The average attendance at the monthly meetings has been a little over 8, exclusive of visitors.

The subjects discussed at the meetings were as follows:—

Nov. 13. Paper on "Double-Staining Wood Sections," by the 1890. Chairman—Mr. W. B. Poole.

Mar. 11. Paper on the "Development of Fresh-water Polyzoa," by the Chairman—Mr. W. B. Poole.

April 8. Gossip meeting.

May 13. Paper on the "Amphipoda," by Mr. E. J. Bradley.

June 10. Paper on "Collecting Marine Objects with the Tow-net," by Mr. W. H. Baker.

July 8. Demonstration on obtaining oblique light with high powers without use of condenser or mirror, by Dr. T. Whittell.

Aug. 12. Paper on "Preparing and Mounting Teeth," by Mr. S. L. Moody.

On the 15th October a joint conversazione was held with the Field Naturalists' Section, and was fairly attended, considering the unfavourable weather.

The following excursions were made :—

Nov. 10. Henley Beach.

Mar. 22. Trawling expedition with Field Naturalists' Section.

Aug. 9. Blackwood.

The balance-sheet shows a balance in hand of £4 8s. 7d.

D. Fleming, Acting-Chairman.

J. W. Russell, Secretary.

September 30, 1890.

MICROSCOPICAL SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA.

Receipts and Expenditure for Year Ending 30th September, 1890.

1889.	Receipts.	£	s.	d.
Sep. 30.	Balance in Hand	8	3	5
1890.				
Sep. 30.	Subscriptions Received	8	5	0
	Royal Society	8	5	0
		£24	13	5

Payments.	£	s.	d.
Magazines	1	15	0
Binding Magazines	2	0	0
Stationery	1	4	0
Printing Proceedings	2	3	0
Post Cards and Printing same	0	16	6
Covers for Magazines	0	10	0
Postages, &c.	1	6	4
Attendance	1	9	0
Expenses of Joint Soiree	0	16	0
Royal Society	8	5	0
	£20	4	10
Balance in Hand	4	8	7
	£24	13	5

Audited and found correct,

S. L. MOODY,
W. H. BAKER, } Auditors.

30th September, 1890.

GENERAL INDEX.

[The species and genera, the names of which are printed in italics, are described as new.]

Acantholophus *Franklinensis*, 92.
Acrilla *crebelamellata*, 234; *cylindracea*, 233; *escharoides*, 232; *goniioides*, 233; *glyphospira*, 233; *inornata*, 232; *mutica*, 233; *pachypleura*, 232.
Address, Presidential, 257.
Agriophora atratella, 78; *axesta*, 79; *capnoides*, 77; cinderella, 78; cinerosa, 78; confertella, 76; diminuta, 79; *fascifera*, 80; *gravis*, 77; *horridula*, 77.
Alectoria superba, 238.
Anilaria Deyrollei, 147; platessa, 147.
Annual Report of Field Naturalists' Section, 279; Microscopical Section, 284; Royal Society, 252.
Antheræa Helenæ, 236.
Archæan rocks of S. Yorke-Peninsula, 113.
Archæocyathineæ, Australian species of, 10.
Arnheim-Land, new plants of, 242.
Australian Archæocyathineæ, 10; Coleoptera, 82, 121; Fungi, 238; Lepidoptera, 23; Xyloryctidæ, 23.
Biflustra *jugalis* 3.
Blackburn, Australian Coleoptera, 82, 121.
Bolboceras *Richardsæ*, 159.
Botany of Central Australia, 94, 170; S. Yorke-Peninsula, 112.
Buechnera linearis, 104.
Bursaria spinosa, fluorescence of, 237.
Cadmus cinnamomeus, 136; luctuosus, 135.
Callitris verrucosa, var., 120.
Calomela sexmaculata, 138.
Caloscala Mariæ, 230.
Calotis *latiuscula*, 107.
Catoryctis eugramma, 43; subnexella, 43; subparallela, 42; tricrena, 44.
Central Australia, list of plants of, 94, 170.
Cerambyx pullus, 128.
Cetacea, S. Australian species of, 8.
Chalcolampra *rustica*, 138.
Chalartona craspedota, 66; *insincera*, 66; *intabescens*, 65; *melipnoa*, 65; *melitoleuca*, 66.
Circuloscala *foliosa*, 226; *orycta*, 227.
Cirsotrema Mariæ, 230; *pleiophylla*, 231; *transenna*, 229.
Cis æqualis, 127.
Clathrus *interstriata*, 224.
Clerarcha agana, 54; *dryinopa*, 54; *grammatistis*, 53.
Coleoptera, Australian, 82, 121.
Compsoturna olivarchica, 41.
Conorbis *atractoides*, 200.
Conus *acrotholoides*, 199; *atractoides*, 200; *complicatus*, 195; *cuspidatus*, 194; *extenuatus*, 199; *Hamiltonensis*, 200; *heterospira*, 197; *Huttoni*, 198; *ligatus*, 196; *Murravianus*, 200; *ptychodermis*, 195; pullulescens, 196; Ralphii, 198.
Coscinocyathus *Tatei*, 17.
Crisposcala *echinophora*, 226.
Crossea *lauta*, 222; *princeps*, 220; *sublabiata*, 221.
Crydon-bore, 183.
Crypsicharis neocosma, 45.
Cryptarcha, 121.
Cryptophaga albicosta, 33; balteata, 38; *delocentra*, 39; *dolerastis*, 30; ecclesiastis, 32; *epigramma*, 31; flavolineata, 36; *hierastis*, 30; irrorata, 34; leucadelpha, 35; *lurida*, 37; *phæthontia*, 36; porhyrinella, 32; *proleuca*, 31; Pultenaeæ, 38; rubescens, 35; *rubra*, 37; russata, 36; *sarcinota*, 37; spilonta, 35; *stochastis*, 30.
Cypræa *ampullacea*, 205; *amygdalina*, 211; Archeri, 205; *brachypyga*, 206; consobrina, 211; contusa, 206; *dorsata*, 212; eximia, gastroplax, 212; gigas, 212; *Jonesiana*, 205; leptorhyncha, 208; *Murraviana*, 207; *ovulatella*, 208; *parallela*, 203; platypyga, 211; platyrhyncha, 211; *pyrulata*, 207; *scalena*, 203; *sphærodoma*, 209; *subpyrulata*, 206; *subsidua*, 204; *toxorhyncha*, 210.
Delphinus delphis, 9.
Demonassa Macleayi, 131.
Didymocantha *nigra*, 130.
Diprotodon-remains, 236.
Dolphins, List of, 8.
Donations to Library, 269.
Dry Creek-bore, 172.
Dyschirius Torrensensis, 82.
Eglisia *triplicata*, 231.
Eocene limestones of S. Yorke-Peninsula, 113.
Eragrostis trichophylla, 171.
Erato australis, 218; duplicata, 217; *illota*, 217; minor, 215; *Moringtonensis*, 217; *pyrulata*, 216.
Eratopsis *illota*, 217.
Erechthites lacerata, 102.
Eremophila *Tietkensii*, 109; viscida, 105.
Eriostemon *argyreus*, 107.
Estuarine foraminifera, 161.
Etheridge, Australian Archæocyathineæ, 10.
Ethmophyllum *Hindei*, 14.
Euphorbia eremophila, poisonous properties of, 236.
Fluorescence of Busaria spinosa, 237.
Foraminifera of Dry Creek-bore, 177; Muddy Creek-beds, 236; Port Adelaide River, 161.
Fungi, new species of, 238.
Gastropods of the Older Tertiary, described, 185; reviewed, 243; of the Older Pliocene, list of, 175.
Geology of S. Yorke-Peninsula, 112.
Girvanella sp., 19.
Goodenia *fasciculatis*, 108.
Grampus griseus, 9.
Hectoria Pontoni, 238.

Heliotropium filaginoides, var. heteranthum, 171
Helipterum Fitzgibboni, 170.
Hemiacirsa *lampra*, 234; *polynema*, 235.
Heredity, Weissmann's theory of, 257.
Homœlacon gracilis, 90.
Howchin, Estuarine foraminifera, 161; foraminifera of Dry Creek-bore, 177; Muddy Creek-beds, 236.
Hypertricha ephelota, 74.
Ipomœa *racemigera*, 108.
Kirk, on the Soaring of the Hawk, 110.
Kogia breviceps, 9.
Læmophloeus pusillus, 121.
Lamellibranchs of Older Pliocene, 174.
Lepidiota capdata, 84; *grata*, 86.
Lepidoptera, descriptions of Australian, 23.
Leschenaultia striata, 103, 171.
Lichenaula arisema, 48; *calligrapha*, 48; *choriodes*, 50; *laniata*, 47; *lichenea*, 49; *lithina*, 49; *mochlias*, 52; *musica*, 51; *tuberculata*, 50; *undulatella*, 47.
List of Fellows, 276.
Macdonnell Range, plants of, 94, 170.
MacGillivray, list of S. Australian Polyzoa, 1.
Mammaliferous Drift about Adelaide, 182.
Maroga *mythica*, 41; *setiotricha*, 40; unipunctana, 40.
Megaptera boops, 8.
Melobasis costata, 146; costifera, 146; prasina, 146; purpureo-signata, 146; *Thomsoni*, 146; viridiobscura, 146.
Membranipora *prælonga*, 3.
Meyrick, Descriptions of Australian Lepidoptera, 23.
Minthea, 121.
Muddy Creek-beds, foraminifera of, 236.
Mueller, Plants of Central Australia, 94, 170.
Natalis constricta, 124; fasciata, 125; *hirta*, 122; inconspicua, 124; longicollis, 126; lugubris, 123; *spinicornis*, 123.
Neobalæna marginata, 8.
Neolepidiota obscura, 86.
Neosimnia *exigua*, 218.
Nodiscala *baxinodosa*, 224; *Hamiltonensis*, 225; *prionota*, 225.
Notosara nephelotis, 52.
Older Pliocene near Adelaide, 172.
Older Tertiary Gastropods, 185, 243.
Pachydissus *boops*, 128; *Tatei*, 129.
Paracadmus lucifus, 135; maculatus, 135.
Paropsis *ænea*, 143; circumdata, 143; *confusa*, 142; *gibbosa*, 139; *Froggatti*, 145; hemisphærica, 141; *insularis*, 139; *Meyricki*, 141; mimula, 142; nigerrima, 145; *nitidissima*, 140; polyglypta, 144.
Parasite of Stick-case Moth, 236.
Phtthonerodes scotarcha, 45.
Phyllotocus dispar, 83.
Phyllotreta *australis*, 146.
Phylomictis maligna, 75.
Physeter macrocephalus, 9.
Pilostibes enchidias, 27; *stigmatica*, 27.
Plants of Central Australia, list of, 94, 170; new species of, 107.
Plants of S. Yorke-Peninsula, list of, 116.
Plants, new for S. Australia and Arnheim-Land, list of, 242.
Platymopsis *Frenchi*, 132.
Plectophila discalis, 55; electella, 55.
Pleistocene deposits, S. Yorke-Peninsula, 113.
Pliocene deposits in Australia, 172; Croydon-bore, 182; Dry Creek-bore, 172.
Pliocene fossils, 174.
Poisonous properties of Euphorbia eremophila, 236.
Polyoptilus Erichsoni, 133; *gracilis*, 134; Lacordairei, 133; *robustus*, 134.
Polyzoa, South Australian, 1.
Port Adelaide-river, foraminifera of, 161.
Prionopleura crucicollis, 136; *erudita*, 136; flavocincta, 136; *suturalis*, 137.
Proceedings of the Society, 245.
Procometis bisulcata, 71; *diplocentra*, 73; *genialis*, 73; *hylonoma*, 72; *lipara*, 72; *monocalama*, 72.
Protopharetra *Scoulari*, 18.
Pseudocœdius squamosus, 91.
Pseudocavonus antennalis, 87.
Pseudolacon rufus, 89.
Puncticscala *bulbulifera*, 228; *eritima*, 228; *loxopleura*, 227; *microrhysa*, 229.
Pupation of Antheræa Helenæ, 236.
Ramphus australis, 93; *distinguendus*, 93.
Report of Native Fauna and Flora Protection Committee, 281.
Scalaria *baxinodosa*, 224; *bulbulifera*, 228; *crebrelamellata*, 234; *cylindracea*, 233; *echinophora*, 226; *eritima*, 228; *escharoides*, 232; *foliosa*, 226; *glyphospira*, 233; *gonioides*, 233; *Hamiltonensis*, 225; *inornata*, 232; *interstriata*, 224; *lampra*, 234; *loxopleura*, 227; Mariæ, 230; *microrhysa*, 229; *mutica*, 233; *orycta*, 227; *pachypleura*, 232; *pleiophylla*, 231; *polynema*, 235; *prionota*, 225; *transenna*, 229; *triplicata*, 231
Schizoporella Maplestonei, 4; *Smeatoni*, 5.
Scieropepla acrates, 68; *liophanes*, 68; oxyptera, 70; *polyxesta*, 67; rimata, 69; reversella, 68; *serina*, 70; silvicola, 69; typhicola, 68.
Sequenzia *radialis*, 192.
Sida *podopetala*, 107.
Simnia *exigua*, 218.
Steno rostratus, 9.
Stick-case moth, parasite of, 236.
Stigmodera apicalis, 147; Castelnaudi, 147; *cincta*, 157; coelestis, 148; *Dawsonensis*, 155; distinguenda, 148; *eremita*, 153; flava, 148; flavidula, 148; fraterna, 148; *Frenchi*, 150; fusca, 147; *guttata*, 158; *guttaticollis*, 157; *jubata*, 150; *Karattæ*, 149; *Kerremansi*, 147; Lais, 158; Laportei, 147; *marmorea*, 148; obesissima, 148; *pallidipennis*, 154; picea, 147; rubrocincta, 157; *stillata*, 148; trispinosa, 156; *Victoriensis*, 152; *Winnnerœ*, 151.
Stirling, Address on Weismann's Theory of Heredity, 257.
Soaring of the Hawk, 110.
South Australian Archæocyathineæ, 10; Plants, 94, 107, 242; Polyzoa, 1; Whales and Dolphins, 8.
Southern Yorke-Peninsula, Geology and Botany of, 112.
Symphyletes modestus, 131.
Tate, Yorke Peninsula, Geology and Botany of, 112; Gastropods of Older Tertiary of Australia, 185; Tertiary formations about Adelaide, 180; Pliocene deposits at Dry Creek, 172; Plants of Central Australia, 94.
Telecrastes bipunctella, 63; *calligramma*, 64; laetiorella, 62; *melanula*, 62; *micracma*, 64; parabolella, 63; placidella, 63.
Tertiary formations about Adelaide, 172, 180; gastropods, 185, 243.
Teucrium *grandiusculum*, 108.
Tietkens, list of plants collected by, 94, 170.

Trichotropis *accrescens*, 189 ; *angulifera*, 186; *apicilirata*, 190 ; *costata*, 191 ; *fenestrata*, 191 ; *interlineata*, 190 ; *quinquelirata*, 189 ; *subquadrata*, 188 ; *tabulata*, 187 ; *triplicata*, 188.
Trigonothops, 82.
Trivia avellanoides, 213 ; *erugata*, 214 ; *pompholygota*, 214.
Tympbophora peltastis, 56.
Uzucha humeralis, 26.
Warburton, Col. Egerton, obituary notice of, 252.
Water-analysis, Dry Creek-bore, 179.
Weismann's Theory of Heredity, 257.
Whales, List of South Australian, 8.
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